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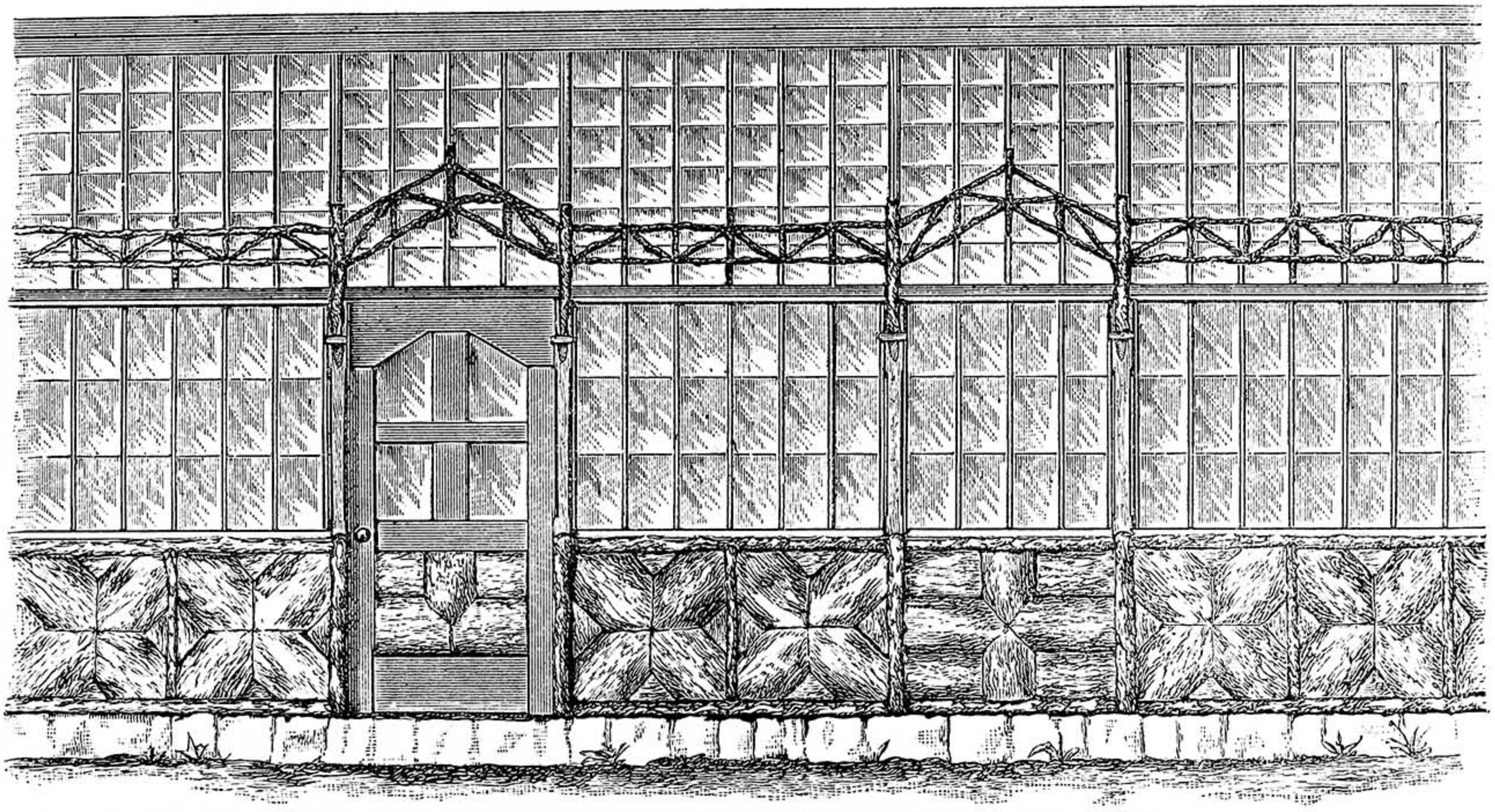


Fig. 1.—Front Elevation of Glazed Rustic Verandah, to be utilised for Grape Culture.

A GLAZED RUSTIC VERANDAH, TO BE UTILISED FOR GRAPE CULTURE.

BY ARTHUR YORKE.

THE APPLICATION OF RUSTIC-WORK TO GLASS HOUSES — MATERIALS — CONSTRUCTION AND ORNAMENTATION.

The Application of Rustic-Work to Glass Houses.—It has been asserted by some who consider themselves authorities in matters of taste that nothing of the nature of a greenhouse ever harmonises with natural surroundings, or is otherwise than an eyesore in a garden in other respects beautiful. This, though rather sweeping, must be admitted to have a certain amount of truth in it. We are all agreed as to the utility of such buildings, and habit has in some sort deadened our perceptions as to their looks, but it must be owned that the hard, straight lines of wood or metal, and wide surfaces of shining glass, are not pleasing, and are too suggestive of the shop and factory to accord well with natural objects; nor have the attempts made to render glass houses ornamental been, as yet, attended with much success.

It has been suggested that the difficulty might be overcome by combining rustic-work with glass. This, at the first glance, looks like a thing which might easily be done; but, on consideration, it will be seen to be otherwise. Rustic carpentry is in its nature irregular, and cannot be brought to those level planes and straight lines essential to glass-work; whilst for interiors, and especially those of houses intended for vines, rough bark-covered surfaces afford too much shelter to insect pests—so that, in reality, rustic-work can only be made applicable to a very limited extent. In the grape-growing verandah before us, therefore, I have introduced a limited amount of rustic-work only, and that on the outside, leaving all within to the plane and the paint-brush.

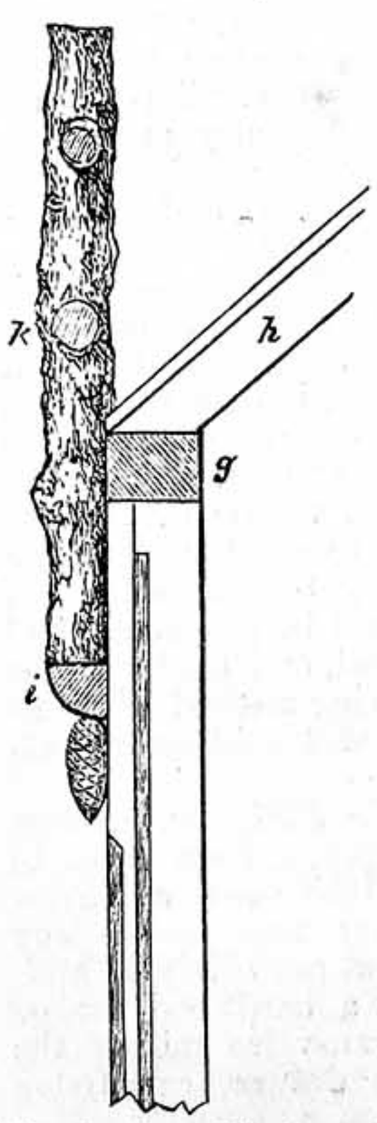


Fig. 3.—Top of Post (side view).

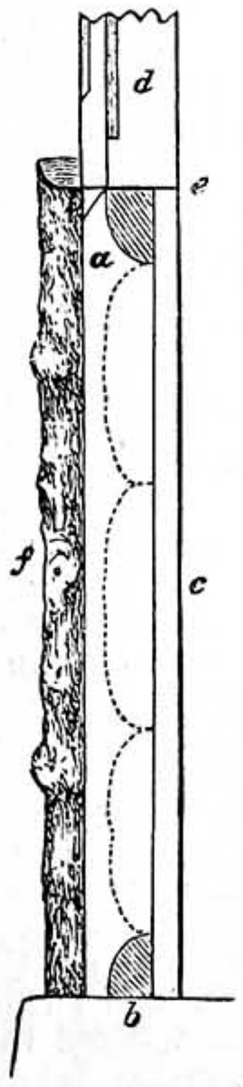
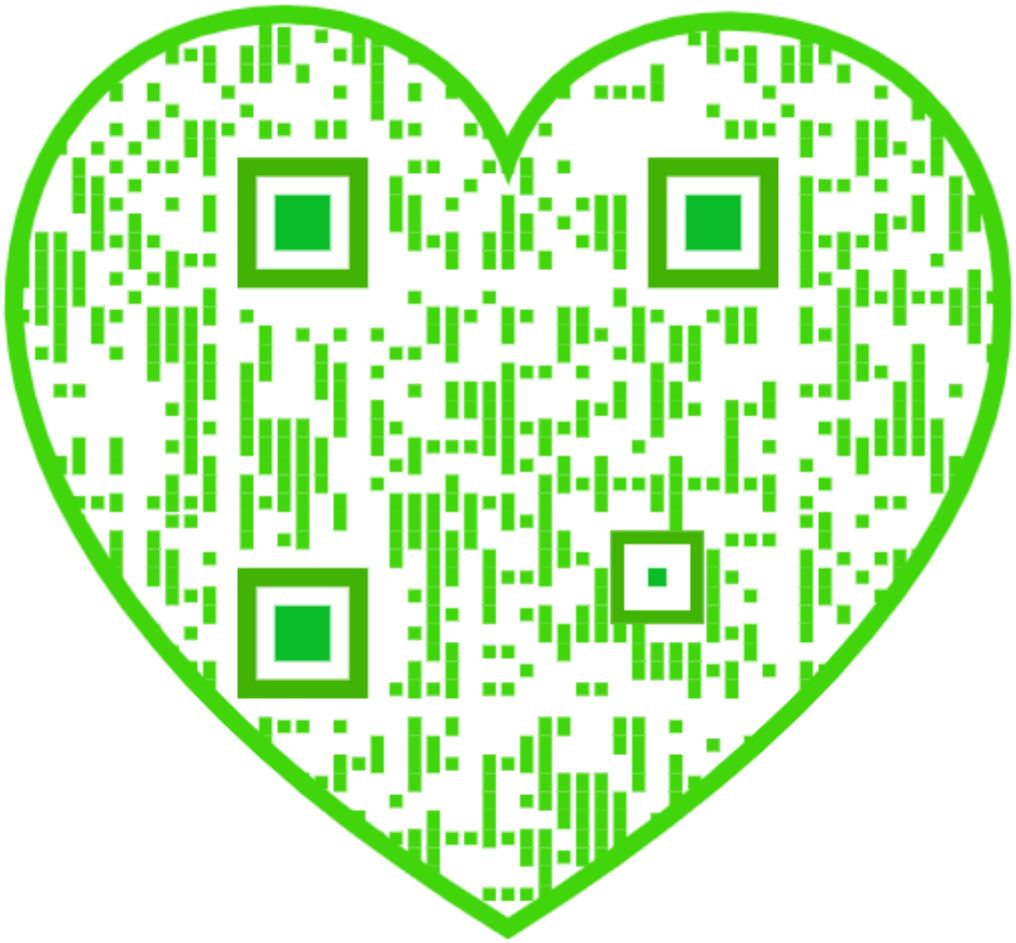


Fig. 2.—Bottom of Post (side view).

Materials.—Such of the materials as are of a rustic kind are, for the parapet and uprights, some rather small larch poles or other tolerably straight round stuff, and for the panels, some of those "slabs," or rough outside planks, of which fuller mention was made in my recent paper, "A Model Rustic Tool-house" (page 225). As to the posts, and such parts as are not rustic, they are supposed to be of good deal. The sash-bars, which carry the glass both in roof and walls, are to be bought struck by steam at a lower price than they can be worked by hand, or sashes may be bought ready glazed. For glazing work of this kind, 16 oz., or sometimes 20 oz.,



glass is used, the former, I believe, being generally thought sufficient.

Construction and Ornamentation.—As in the design recently given for an open rustic verandah, it is intended that the collar-posts should be set upon and dowelled into a raised platform of masonry. The present structure is, of course, intended for the warmer sides of a house, south or west. The width, to meet particular cases, can be varied, but is, according to the drawings, 4½ ft. The posts are 6 ft. high and 3½ in. square. They are set with spaces between them alternately of 3 ft. and 4½ ft. On their tops rests a wall-plate of the same width as themselves, and 2½ in. deep. The rafters, which are sash-bars rebated to carry the glass, rest on this wall-plate, and against a second vertical one fixed to the house wall.

Fig. 1 is a front elevation of a portion of the verandah, whilst Fig. 2 gives a side view of the lower half of one of the collar-posts. At *a*, in Fig. 2, is seen the section of the upper cross-rail, which has its top 2½ ft. from the ground; at *b* is the lower cross-rail, or sill. Both are of quartered rough stuff, and are mortised to the post ¾ in. from its inner edge, so that when the ¾ in. boarding, *c*, is nailed against them, it will come flush with the inner side of the post. At *d* is indicated the sash-frame, with its rebate for glass, which occupies the upper part of the opening; and at *e* is a metal flashing between rail and sash to throw off rain. It is proposed that the sashes in the narrower openings only should be made to push outwards at bottom for ventilation. At *f* is a piece of halved rough stuff nailed to the front of the post.

The panels, which occupy the lower part of the space between the collar-posts, are filled with pieces of rough plank or "slab," as shown in Fig. 1. These pieces should wear their natural bark as far as possible; they are nailed to the inner boarding.

In Fig. 3 the upper part of a post is in like manner shown in profile: *g* is the wall-plate in section, and *h* is the lower end of a rafter. At *i* will be observed a strip of quartered stuff nailed across the post (with a fir-cone bradded beneath it), which gives a starting-point to the upright *k*, by which the openwork rustic parapet is supported. These uprights are of small round stuff, slightly flattened on the side towards the post. The openwork parapet is too plainly figured to need description; it is intended to break to a certain extent the straight lines, and partially to conceal the glass-work of the roof, without seriously interfering with sunshine.

So much of the planed wood-work as shows outside should be painted of a good brown, to assimilate with the rustic-work; in the interior the time-honoured white or drab paint will probably hold its place. But internal arrangement—and, indeed, everything which is purely greenhouse construction—is beyond my province, such matters having already been ably treated in Work. (See the Articles at p. 177, Vol. I., etc., to which I refer the reader.)

Of the illustrations, Fig. 1 is drawn ⅓ in. to the foot, whilst Figs. 2 and 3 are on a 1 in. scale. Of course it must be borne in mind that these are somewhat small for practical work, and that the reader, before he begins to carry out the idea, should make a working drawing on a larger scale, after having made such modifications in the structure as circumstances may suggest as being desirable.

HOW TO MAKE DRAWERS SLIDE EASILY AND TRUE.

BY E. W.

Drawers that Jam and the Cause of Jamming—Irregular and Unusual Shapes—How to overcome the Difficulties arising from Unfavourable Proportions or Irregularity of Form.

Drawers that Jam and the Cause of Jamming.—Everybody knows how troublesome some drawers are to move in or out; they seem as if endowed with a prodigious amount of mechanical perversity; first they jam at one end, and then at the other, occasioning at times considerable exasperation of spirit, and I fear that not a few regretable outbursts of profanity may be traced to this cause. It will almost invariably be found that the drawers that give so much trouble have fronts that are long in proportion to the length of the sides, though at times the trouble is wholly, or partly, due to the particular form of the drawer. In well-made and well-fitted drawers, the liability to jam is not so great as with those loosely

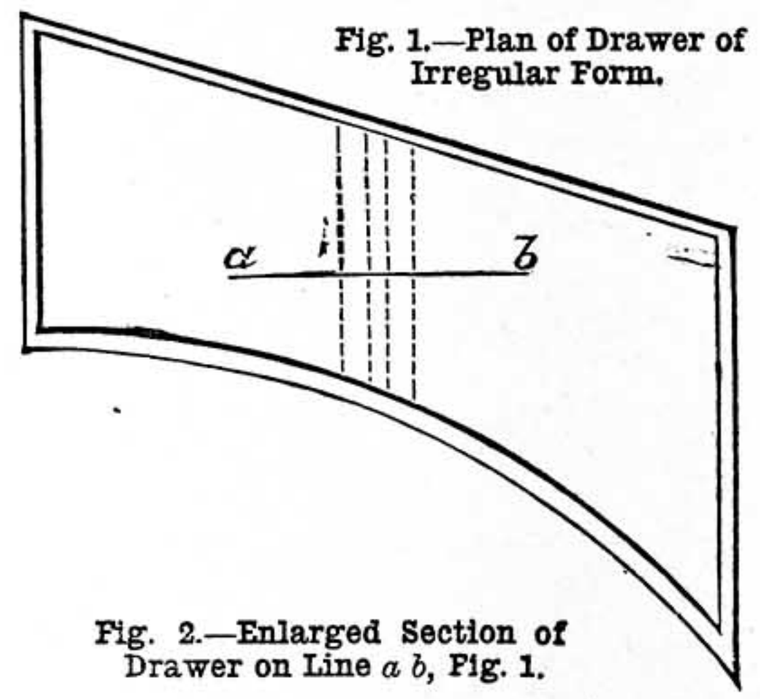


Fig. 1.—Plan of Drawer of Irregular Form.

Fig. 2.—Enlarged Section of Drawer on Line *a b*, Fig. 1.

thrown together to sell; but however well made and fitted, drawers of the character referred to are very apt to stick fast by jamming endways, if unequal opening or closing force be applied at the two ends, especially so when the drawer has been drawn well out and but a small portion is within the case. This difficulty may easily be got over by a very simple device that I have found to work well, and that deserves to be generally known.

Irregular and Unusual Shapes.—Fig. 1 is the plan of a drawer I once had to make for a circular corner of a counter, and this, it will be seen at a glance, is of a form that, under ordinary circumstances, would prove a continual source of annoyance to those whose lot it would be to use it. It was this case that led me to specially consider the conditions necessary to secure free and easy running of drawers in particular, and sliding bodies in general, and finally to the adoption of the following method of treatment for all drawers of troublesome form or proportion.

How to Overcome the Difficulty.—Across the bottom of the drawer, from front to back, and parallel to the sides, a narrow groove is formed, that may be in any convenient position, but preferably in mid-length, and such that a hardwood tongue or fillet, fixed to a transverse rail of the framework below the drawer, can freely slide therein.

The drawer, Fig. 1, was joiner-made, and consequently minus the centre rail in bottom that a cabinet-maker would in this case have put, and wherein a groove might with advantage have been ploughed. A couple of fillets were, therefore, glued and screwed to the bottom, as shown by the dotted lines, Fig. 1, and the enlarged section at *a b*, Fig. 2. This answered admirably, and made the drawer the nicest working one in the whole place.

HOW TO MAKE A QUARTER HORSE-POWER STEAM ENGINE.

BY F. A. M.

Boring the Cylinder.

Description of Working Drawings—Making the Boring-Bar and Cutter—Fixing Cylinder Casting on Saddle—Speed and Feed—Other Ways of Boring—Turning the Flanges and Enlarging the Ends of Bore—Turning the Cylinder Covers and Screwing the Stuffing-Box and Gland.

Construction of Engine.—Fig. 4 is the elevation of our engine; and Fig. 5, the plan. Fig. 6 shows the back view, and Figs. 7-29, the various details, the most important dimensions being marked in figures, as is done in engineers' workshops. These, making a full page of cuts, will appear in the next article. Paper expands and contracts slightly, according to the weather; so that, besides the trouble of measuring the drawings with the rule, such measurements are never to be depended on; whereas, when the draughtsman has written the dimension upon the drawing in feet and inches, it is read at a glance without measuring, and reads always the same. It is usual, instead of writing "ft." or "in." upon the drawing, to designate feet by one dash or accent and inches by two: thus, 2 ft. 3 in. would be written 2′ 3″, the figures being placed about the middle of a blue or dotted line extending the whole distance measured, and terminating in an arrow-head at each end.

The writer well remembers seeing, some ten years ago, working drawings of a small power engine similar to Figs. 4 and 5, but smaller and less complete, which drawings were offered for sale with the requisite castings and other materials. The charge for the drawings alone (lithographed) was one guinea. Now, however, such drawings can be obtained at about two shillings, without, however, showing pump or governor. It is believed that these plans now offered to the readers of Work surpass any hitherto published in completeness and fulness of detail, every important part having been drawn out separately, as is usual with larger engines in engineers' works. The facilities usually possessed by amateurs have been considered, and slight departures have been made from the usual practice (when that could be done without injury) in order to simplify the work.

It is a great satisfaction to the present writer to know that the design has the approval of J. H., and that Olla Podrida will probably write on a boiler of suitable size.

Looking at Figs. 4 and 5, it will be seen that the cylinder overhangs the bed-plate, which latter is cast with a round flange at the back end, against which the front cover of the cylinder is bolted; thus the length of bed-plate which would have extended under the cylinder is dispensed with, as also the

feet, which would have had to be cast on the cylinder. A small amount of fitting is saved, and some weight of metal; moreover, the cylinder, being attached by one end only, is free to expand lengthways when heated by the steam.

Taking in hand the cylinder first of all, it should be bored with a bar, which will require a slide or self-acting lathe. Possibly a boring-bar to bore a 2 in. cylinder 5½ in. long may be borrowed from a neighbouring shop, or hired; but we will suppose it must be made. Get from the blacksmith a piece of 1¼ in. round iron 14 in. long; make him square the ends, to save you filing, and then take it to your lathe, and after centring it rather deeply, finish the ends and turn it up true. It will now be about 1⅛ in. diameter. At its middle, scratch two fine lines round the bar with a point tool, ⅞ in. apart; between these lines and through the middle of the bar a hole or slot must be cut, ⅞ in. long and $\frac{3}{16}$ in. wide, to take the cutter and wedge. To do this, we must first mark the position of the hole on both sides, the marks being exactly opposite, so as to ensure that the cutters shall pass through the middle. Wrap a slip of paper round the bar, and cut it so that it will just meet; by folding this in half, we can measure half round the bar. Take $\frac{3}{16}$ in. in the dividers, and mark that distance off upon one of the lines marked on the middle of the bar; measure half round with the folded paper, mark two other spots on the other side of the bar, and indent these marks with a centre-punch. To draw four lines from each of these four points, parallel with the bar and with each other, we must use the point of a tool held in the slide-rest, the work being held still by advancing the back-centre by its screw so as to jam the bar between the centres. A point tool turned over to lie on its side will do this best; the bar would be turned round till the dots of the centre-punch come to the point of the tool; the screw of the back-centre would then be forced a little, to prevent the bar from turning; and the tool moved sideways by the screw of the rest after advancing it to touch will mark the lines. Fig. 30 will make this quite plain.

Having marked the place for the hole on both sides, we must now remove as much of the material as possible by drilling with a $\frac{3}{16}$ in. drill, boring half-way through, first from one side and then from the other, and placing the holes so as almost to cut into one another. A narrow cross-cut chisel will now be used to cut out the metal between the holes, and the hole will then be finished by filing, cutting away just up to the lines at both sides, and trying to keep the sides and ends of the hole flat, and not rounded; which is a rather difficult matter. Several such holes will have to be cut in the course of our work; it will be well, then, to do our best with this one without being discouraged, though it is not a very easy job. Now obtain for the cutter and wedge two pieces of tool steel ½ in. wide, $\frac{3}{16}$ in. full thick, and 2⅛ in. long. File these up, flatways first, to exactly $\frac{3}{16}$ in. in thickness, trying them with the callipers to ensure their being the same thickness throughout, and trying them in the slotted hole; when you can get them in about ⅛ in., file them no thinner, but fit the hole to them. This is done because, in spite of the utmost care, the sides of the slot are sure to prove round, causing the hole to be wider at each end than in the middle, which you will find out as soon as you try to push in the slips of steel. Your efforts then should be directed to filing away the metal in the middle, without enlarging the mouths of the hole, and this must be continued until the wedge and cutter can be pressed in with the fingers. It will greatly help in filing the sides of the hole flat if the bar be placed between the centres of the lathe, and filed while free to turn on its own axis. Now square up one edge of each of the pieces of steel, round the corners a little, and use them to finish the ends of the slot, carefully filing them out till the steel pieces will bed down solidly upon either end. Fig. 31 is a section through the bar, showing the cutter and wedge in position; and Fig. 32 is an end view. The cutter may now have the shallow notch filed in one edge, but this notch is not so wide as the diameter of the bar, because there must be a small flat filed across the mouths of the hole on each side of the bar, so that the shoulders of the notch on the cutter may bed down on the flats so formed, and not on the round surface (Fig. 32 shows these flats). The cutter having been well fitted, so that it requires pressure to force it into place, its back may now be filed across and tapered to suit the wedge; a workman would know by instinct how much taper to give so that the wedge may not jar loose in working, but the amateur had better go by rule; and the rule for the taper of "fast" keys is ¼ in. per foot=$\frac{1}{16}$ in. in 3 in.; since, then, our cutter is 2 in. long, the width at one end should be less than that at the other by $\frac{3}{64}$ in., or, say, $\frac{1}{16}$ in. bare. Having thus finished filing up the cutter, file up the edges of the wedge, making sure that it fits the whole length of the hole, and not merely at one end; then shorten its ends as in Fig. 31, put the cutter in position, drive in the wedge firmly, put the bar in the lathe, and turn up the ends of the cutter till it measures 2 in. long; take also a cut down the front or cutting edges of the cutter, to ensure those edges being true. The cutter must now be removed from the bar, but before doing so, be careful to mark both it and the bar, so that you may be able to put it back the same way, otherwise all your trouble in turning it will have been wasted. Having taken out the cutter, proceed to "back off" the cutting edges with the file; these edges which do the work are marked *a*, *b*, in Fig. 31. In Fig. 32 the letters *a*, *b*, are placed close to the leading or sharp edge. The file must slope the cutter back from these edges, so that they may have a cutting angle of about 80°. The edges will have to slant in contrary directions, and in doing this "backing off" be careful to leave just a trace of the tool-marks left by turning so as to ensure that the edges shall cut equally. Having finished the cutting edges, proceed to back off the guiding or scraping edges, *c*, *d*, removing rather less in this case than in the first, and the cutter will be ready for hardening. Any fire will do for this, provided there be a good amount of red coals; twist a piece of stiff iron wire round the cutter, leaving a foot or so of the wire for a handle; have about a quart or so of water ready, which may be slightly warm, and when the cutter is thoroughly and equally red, plunge it endways into the water, and leave it a minute. Now take out and try with a file, when, if quite hard, it is to be taken to the grindstone, and the edge slightly ground: it does not require to be "let down" or tempered, because the edge being 80°, it is quite strong enough without, and, thus treated, it will go right through the cylinder without showing any sign of wear, coming out as sharp as it went in. The boring-bar and wedge are very likely to come in useful for other work, as many cutters may be made for it of different lengths, so as to bore holes from 1½ in. to 2½ in. in diameter.

The next thing will be to secure the cylinder casting upon the saddle in such a way that its centre line may be true with that of the lathe centres. Figs. 33 and 34 show one way of doing this, which may perhaps suit the majority, though each will have to manage so as best to suit his own lathe. The upper part of the slide-rest is supposed to have been removed, and in its place is bolted a flat plate of iron from ¼ in. to ½ in. thick; two pairs of wooden clamps are prepared to fit the cylinder, and bored through for the four holding-down bolts, made of ¼ in. round iron, tapped into the square plate at their lower ends, and fitted with nuts and washers at the top. Our aim here will be to cut away the lower clamps by degrees till the cylinder comes level at the exact height of centres; it can be taken out of twist by slacking the two holding-down bolts, and turning round the square plate, A, which plate will require to be hammered fairly flat by the blacksmith, and it must have two thoroughfare holes in it to pass the holding-down bolts which secure it upon the slide, as well as the four tapped holes which receive the ends of the bolts which secure the wood clamps. The side on which the plate A is bolted would be fixed by tightening the screws of the gib *b*.

Having fixed the cylinder firmly in position, so that the boring-bar occupies the centre of the hole at both ends of the cylinder, put the cutter into the slot in the bar, and fix it with the wedge so that it presents its two cutting edges towards the hole; put on the requisite change wheels to give a feed of about seventy to eighty cuts to the inch; put in the back gear with the band on a slow speed, to give about one turn of the bar to three or four treads, and you are ready at last to begin cutting. This cut should be carried right through without stopping, and it will take perhaps about half an hour. It will be well, therefore, to oil up the lathe before you begin, and to choose a time when you are not likely to be interrupted; the lathe should drive easily, and the cutter should remove an equal amount of metal all round, and take off as much with one edge as with the other. The cylinder casting will soon get pretty warm under the cutting, which will cause it slightly to expand in size; if the cutting were stopped for long, so that the metal began to cool, there would be produced a slight groove or inequality in the bore quite perceptible to the finger. This suggests that it would be an additional precaution, just before beginning to cut, to slightly warm the casting, which could be done equally all round by holding inside it a red-hot poker till it felt warm to the hand, then replacing the bar, and beginning to work at once. The cutter can take a cut of $\frac{1}{16}$ in. all round, and one cut should be enough to finish the bore, leaving a fine surface, bright and smooth, and perfectly parallel. If it is not so, and for any cause it were necessary to take another cut, the cylinder would be left as it is whilst another cutter was made a little larger than the first, to bore, say, 2⅛ in.

As soon as the cylinder is removed from the lathe, rub it out carefully with an oily rag, to clean and preserve it from rust, and examine the bore on the side of the port-ways; for it is possible, unfortunately, that the boring may expose a blowhole in the casting, making a communication between

Fig. 4.—Side Elevation of Quarter Horse-Power Steam Engine (one-third full size).

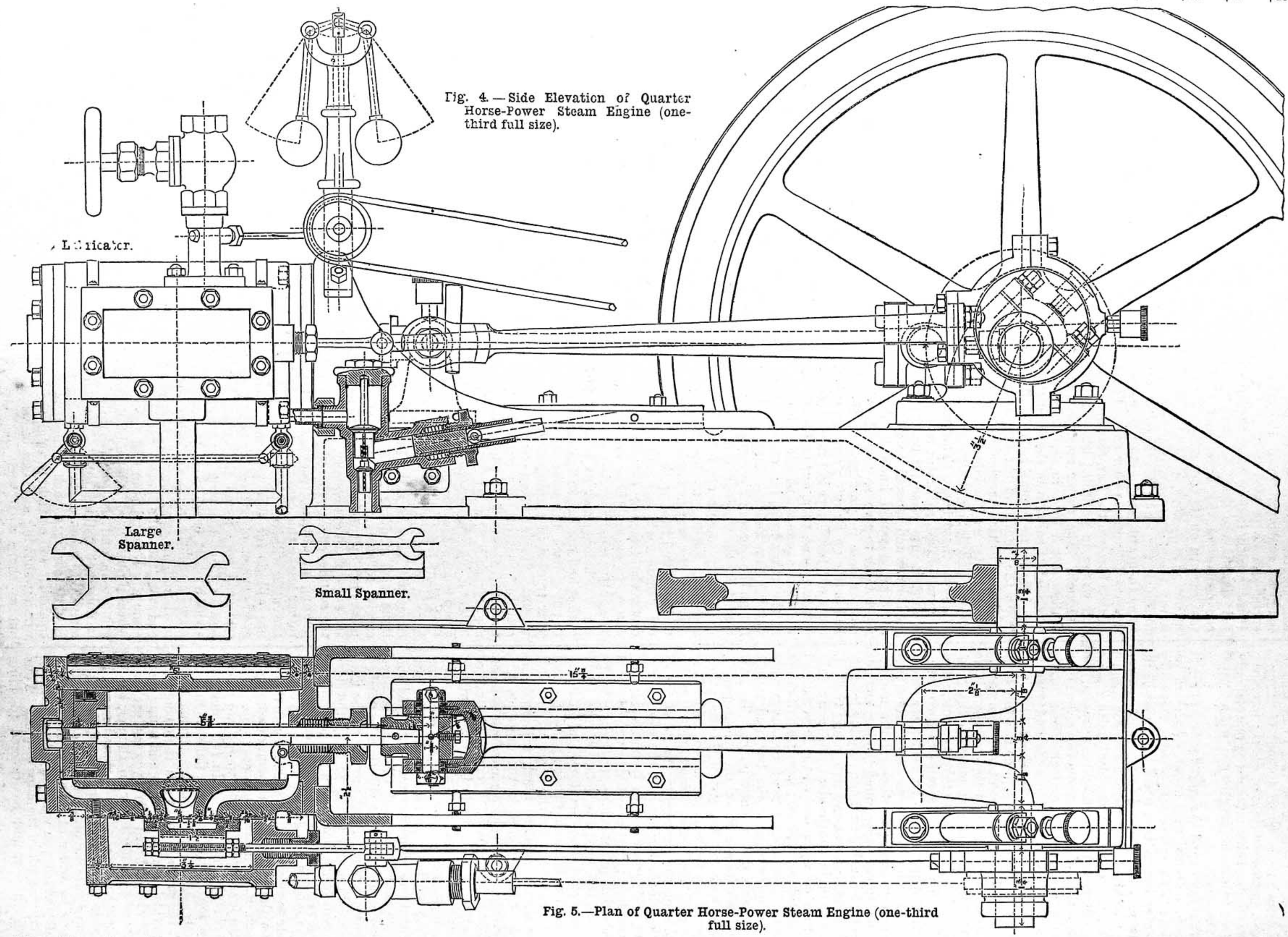


Fig. 5.—Plan of Quarter Horse-Power Steam Engine (one-third full size).

the inside of the cylinder and the port. If the blowhole is a bad one that you cannot stop by screwing in a little plug with red lead, the casting should be returned for another.

But what, it may be asked, are those to do who have only a slide-rest, and no self-acting lathe, with a saddle, on which the cylinder casting can be bolted? Without going into details, it may be said that if the slide-rest have a traverse of at least 5½ in., and the mandrel of the lathe be strong and not too short, the cylinder might be mounted upon the face-plate, and bored with a strong inside tool of about 1 in. square. The cylinder, however, will stand over-neck a good deal, and so will the tool. Perhaps a strongly built 6 in. or 7 in. lathe might do the work tolerably well. The hole would be made slightly larger at the mouth, and then carefully corrected until a solid gauge, made something like the piston and rod, will fit perfectly all the way down. Yet another way would be to use a couple of flat drills, such as would be used for boring a pulley or other hole in cast iron; and this could be done by one who had no slide-rest: both these plans would produce inferior work, and would render necessary the use of a grinder to finish the bore true and smooth; moreover, a person who wished to make up this engine without having a slide-rest, ought first to begin by making himself a slide-rest, or he will find himself most seriously embarrassed further on. The reader will pardon so lengthy a description of this first stage in our work when he understands that the greater part of the friction of the engine is due to the piston, and that any want of truth and perfection here would cause serious waste of power and steam. Let him, then, not try to hurry this part, but rather to do it well; it may take three days to make the boring-bar and cutter and to fix the cylinder in position, although the actual boring can be quickly done.

The next operation will be to turn the flanges of the cylinder true with the bore, and to slightly cone out the bore at each end for ½ in. (See the section of the cylinder in Fig. 5.) This is done so that the packing rings of the piston may pass beyond the surface on which they rub; if it were not so, they might wear a slight depression in working, and leave a ridge at each end of the bore, which would make it impossible to get them out. This precaution is always taken in similar cases; as, for instance, in the slide-valve and the slipper guide. We have then to chuck the cylinder true with the bore, so that a flange and part of the bore shall be accessible to the tools. Fig. 35 will show how this can be done. Obtain a piece of round iron, about a foot long, which you can turn up to a diameter of 2 in.; reduce it carefully till you can drive on the cylinder to within about an inch of one end; now you can turn up one flange, and also enlarge the bore by slightly coning it out at that end. When this is done, drive off the cylinder, and drive it on the other way, so as to treat the other end in the same manner. M is the mandrel; D the driver chuck; P a pin driven or screwed into the mandrel to catch the arm of the chuck, in case the workman has no 2 in. carrier. The cylinder must not be driven on very hard, or it may burst. Do not grudge the iron for the mandrel, as it is very likely to come in useful again; turners have quantities of such, of all sizes.

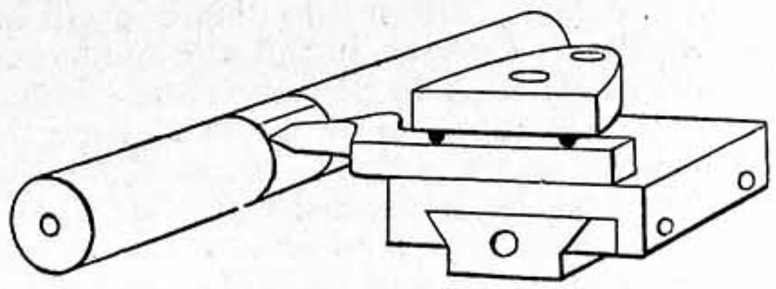


Fig. 30.—Marking Parallel Lines by Fixed Tool in Slide-Rest.

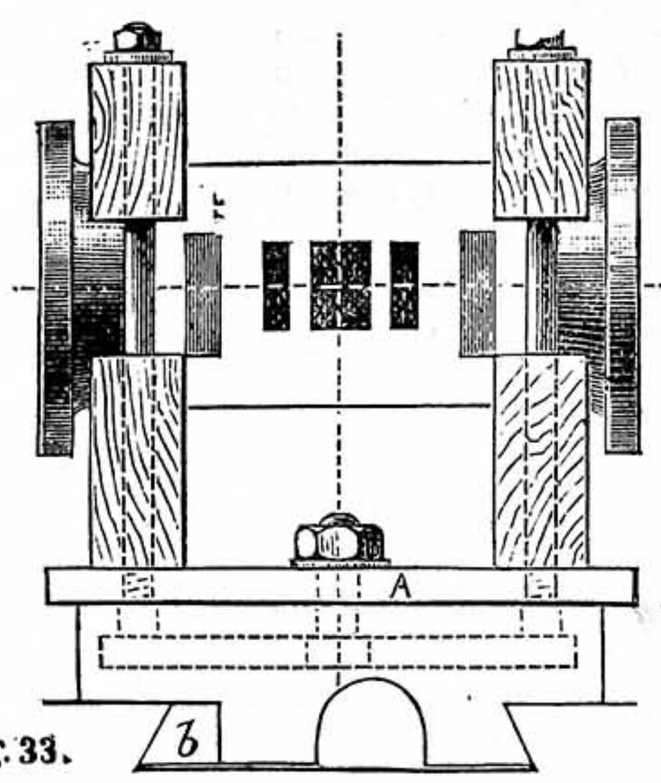


Fig. 33.

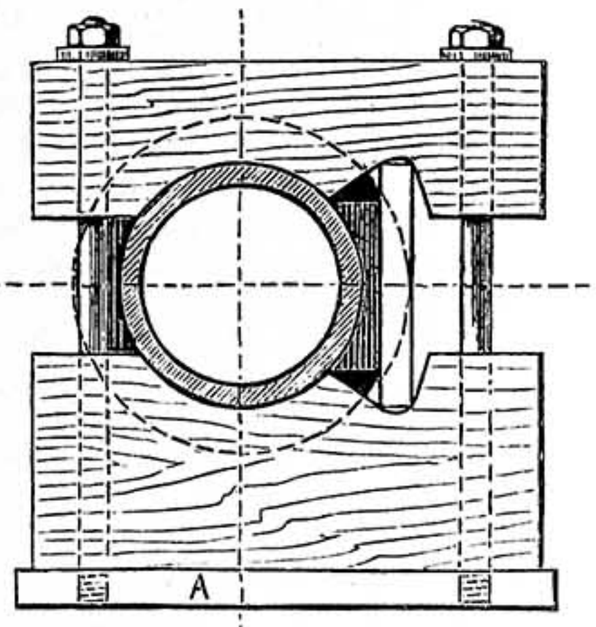


Fig. 34.

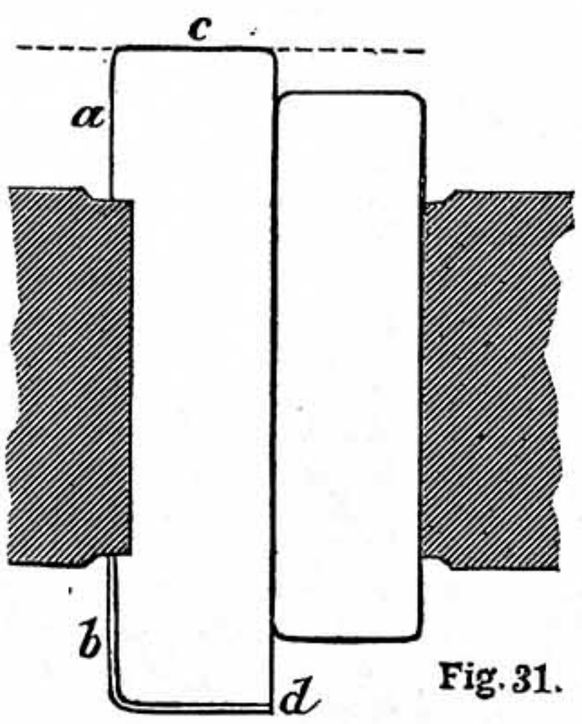


Fig. 31.

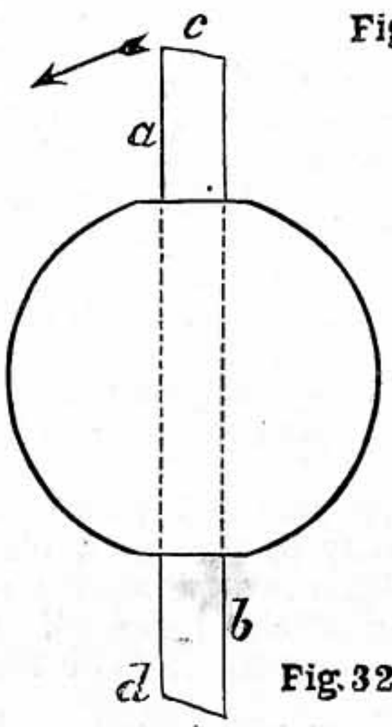


Fig. 32.

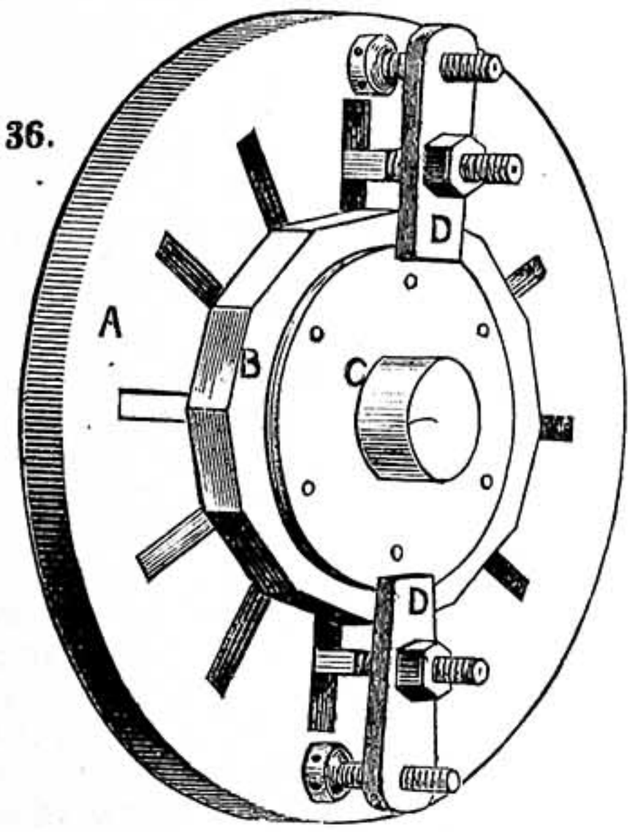


Fig. 36.

Fig. 31.—Section through Centre of Boring-Bar, showing Cutter and Wedge. Fig. 32.—End View of Bar. Fig. 33.—Cylinder Casting fixed ready for boring with Bar. Fig. 34.—End View. Fig. 36.—Cylinder Cover chucked for Turning.

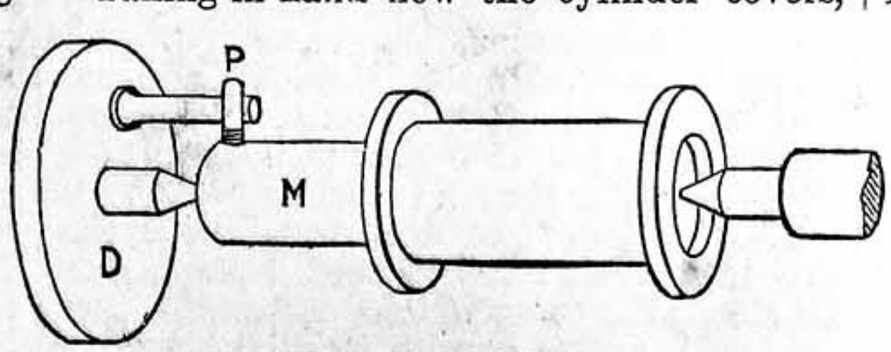


Fig. 35.—Cylinder chucked for turning Flanges.

Taking in hand now the cylinder covers, begin with the bottom cover. An American universal chuck will hold it by the outer edge, or it may be driven into a recess in a piece of hard wood turned out to receive it. Face up the inside surface of the cover flat and true, and make the shallow projection fit exactly into the back end of the cylinder, trying this on to it as it is fixed in the chuck; then with a point tool strike a fine circle 3 in. diameter, to indicate the centres of the six screw holes; mark the positions of these with the centre-punch, not omitting to notice that, whilst four holes equally divide the circle into sixths, one pair are placed further apart by ⅛ in., to avoid clashing with the ports. Lay aside the bottom cover, and take the top, or lid, which has the stuffing-box cast on it; turn up the inside in the same way as the other, fitting it to the other end of the cylinder—that is, the front end, and, after striking the 3 in. circle for the screw holes, bore a ⅜ in. hole truly through the centre of the boss for the piston-rod to pass through. By boring this hole carefully *at the same chucking* as the cylinder fitting, you ensure that the piston-rod shall be exactly in the centre of the bore of the cylinder. Next bore the six holes in the two covers with a drill $\frac{3}{16}$ in. full. To turn the other side of the covers and their rims true with the part already finished, a recess must be made in a hard wood chuck, into which the cylinder fitting on each lid can exactly fit; in making this recess, try each cover in, and begin with whichever has the smallest fitting, because then the recess can be slightly enlarged for the other. Having fitted one cover into the chuck of hard wood (which is supposed to be screwed to the front of a face-plate), place two or three dogs to clasp it firmly by its edge against the front of the wood chuck. Fig. 36 shows the face-plate, A, and the wood chuck, B, of beech, or some wood equally hard, secured by wood screws passing through from the back of the face-plate. B is carefully faced up level, and then the half-turned casting, C, is pressed into a recess turned in the wood to fit the shallow projection, after which the dogs, D, D, are applied to secure and hold it fast, grasping it by the extreme edge, so as to allow the tools to face up almost all the front surface. In the case of the front cover, the shallow fitting on the outside of the cover (Fig. 5) will be formed, and the stuffing-box will be bored, and screwed about 14 pitch, with the screwing lathe; or a ¾ in. gas-thread tap might be used, followed by a chaser, by those who do not possess a self-acting lathe. Finish both covers nicely, and polish with emery-cloth, and, before removing either from the chuck, turn up and

polish their edges to exactly the size of the flanges on the cylinder. To do this, we must remove the dogs, and secure the cover to the chuck by two or three wood screws, passed through the screw holes in the covers into the wood chuck; this method of holding will also allow of finishing the edge of the face of the covers, which could not be touched while the dogs were in position. To complete the cover, take the brass casting for the gland, bore it with a $\frac{3}{8}$ in. hole while chucked in the lathe, mount it on a small mandrel, turn up and screw it with a point tool in the screwing lathe, finishing with a chaser to fit the internal thread in the cover. The screwing lathe will ensure a true thread, but the screw might be marked out by the $\frac{3}{4}$ in. gas stock and dies corresponding to the tap which might have been used to start the thread in the cover, when the chaser would be used afterwards to finish: thus both these screws can be accomplished without a screwing lathe, even by an amateur, who cannot cut them with the chaser alone; but it is not likely they would be very true or correct. All screws of this kind should be cut first in the screwing lathe, and then they may be finished to size and shape by the chaser or the stock and dies. The top of the gland is formed into eight equal sides, that it may be grasped by a spanner. The best way to do this would be by means of a division-plate on the lathe pulley, but, failing this, a template or pattern may be made by drawing the required octagon on tin or sheet metal, and after cutting away the inside and filing to the lines, the template can be used to test the sides of the gland as they are gradually filed to shape. The same template will serve for filing up the pump gland, as that is the same size, to suit the same spanner. Another equally good method would be to file up a little octagon in tin, and use that to file out the spanner (shown with another in Fig. 5); the jaws of this largest spanner being thus correctly shaped, it can itself be used to test the octagons on the piston-rod and pump glands: the smaller end of the same spanner is for use on the six-sided valve-rod gland, union on pump delivery, and cap on pump valve-box.

PICTURE-FRAME GILDING.

BY H. E. MAXTED.

INTRODUCTION—GILDER'S CUSHION, KNIFE, TIP, ETC.—GILDER'S MATERIALS—COMPO.—PARCHMENT SIZE—THIN WHITE—THICK WHITE—CLAY—CLEAR-COAT—MATT GOLD-SIZE—BURNISH GOLD-SIZE—OIL GOLD-SIZE—GILDER'S ORMOLU—MATCHING MOULDINGS—OIL GILDING—BURNISHING—BURNISHERS—GILDING FLATS—RUBBING DOWN MITRES—RE-GILDING.

THE art of gilding, as applied to picture-frames and numerous other articles of interior decoration, requires not a little care and skill to be exercised by the operator, professional or non-professional. The latter presumably possesses a good stock of patience and liking for the work in hand, which should go a great way to balance the experience of the former.

In a back number of WORK, under the title of "Plain and Decorative House Painting," the gilder's cushion, knife, tip, etc., were illustrated and explained; it is therefore quite unnecessary to comment upon them again. In addition to these, some tools are requisite, but they are inexpensive and few. A badger, two or three small sash tools, camel's-hair pencils, and stone jars or pots are all that are absolutely necessary at present.

Before going further into detail, it will be advisable to describe in full the numerous preparations used in picture-frame gilding, so that reference can be made to them in their order as we proceed. First of all, the reader must be impressed with the importance of using clean pots and brushes, keeping all free from dust or dirt of any kind, and not using size when it begins to turn bad. This is scrupulously carried out by the practical man, and materially assists in the production of successful work.

Gilder's materials can be procured from Brodie and Middleton, Long Acre, Rowney, Rathbone Place, or any artists' colourman, and will require to be mixed in the following manner:—

Compo.—Boil seven pounds best glue in seven half-pints of water; melt three pounds of white resin in three pints of raw linseed oil. When well boiled, mix together in a large saucepan, and boil for about half an hour. When done, pour into a boxful of well sifted and rolled whiting. Mix all together, and knead up like dough till it will hold no more whiting. To keep it moist, wrap up in a damp cloth, or bury it in whiting.

Parchment Size.—Wash a handful of fine parchment cuttings in a clean saucepan or other suitable vessel, cover with water, and simmer for two or three hours until the water has evaporated to one-third or one-fourth of its original volume. To test if it is strong enough, the hand should be wetted with the size, the other hand being pressed closely to it. If it is found to be sticky, strain the solution off into a clean jar to cool, and save the parchment to be boiled up again.

This size is used to mix nearly all the preparations required by the gilder, and should, when cold, be a firm jelly; the stronger it is, of course, the firmer it will set, and consequently will require water to be added in some of the preparations.

Thin White.—Parchment size, moderately strong, mixed with rolled whiting and strained through muslin. This must not be too thick.

Thick White.—The same as preceding, with enough whiting to make it thick like cream.

Clay.—When unmixed is very stiff. Place a small quantity of size in a clean stone pot, add a little water, melt, and add a small portion of clay; stir till dissolved, and add more clay till it is of the consistency of cream.

Clear-Coat.—Take a tallow candle, light, and drop two drops in a pot of moderately strong size. The grease will keep it from working up.

Matt Gold-Size.—This is mixed in the same way as clay, but slightly weaker, and is of a reddish tinge.

Burnish Gold-Size.—Mixed the same as clay, but weaker, and is of a bluish tinge.

Oil Gold-Size.—This is bought ready for use or unmixed; if the latter, it must be thinned out with boiled linseed oil and fat oil. A little patent driers will hasten its drying qualities, which should take place in about twelve hours.

Gilder's Ormolu.—There are many recipes for this preparation, but equal parts of white lacquer and methylated spirits (mixed and kept in a bottle) are often used, a few drops being put into the finish size, which is applied after the gold is laid.

Now that we are acquainted with the preparations that will be used, I propose to gild a frame, compo.-faced, Alhambra pattern, with compo. corners, and flat inside.

The practical man has sometimes to match certain mouldings not easily procured, and consequently has to prepare them from the wood; but this is seldom done now, as they can be bought in the white, or compo.-faced and whitened up ready to prepare for gilding, at much less cost than he could make them in small quantities. So if the reader will follow, I will endeavour to explain concisely the art of frame gilding, which of course will embrace furniture gilding, such as chairs, tables, cabinets, or other interior work.

There are two methods of gilding—namely, oil for ornamental work, water for flat or burnished work.

To gild a frame in oil with bead and prominent parts burnished, first wash the ornaments, such as corners or top and bottom ornaments, to free them from grease or dust that will adhere in getting them from the mould. Cold water and a brush must be used—with not too much friction, or the sharpness of the lines may be destroyed. After this is dry, lay a coat of thin white evenly on the frame, applied hot, taking care not to float it or put too much on, but only to cover every part. When dry, take some powdered whiting and hot size, and mix a little of each with a gilding knife or modelling tool; the predominance of whiting will make putty. Then thoroughly overhaul the frame and stop up every defect in the moulding, nail-holes, and corners that are damaged. When this is hard, it must be glass-papered—the flats, hollows, and beads with fine glass-paper, taking care that no defect is overlooked, for the success of our work depends upon the absolute perfection of each smoothing down.

After dusting, it is ready for a coat of clay; but, before this is applied, the parts to be burnished must be determined, and three coats of thick white laid evenly on and glass-papered. Clay should be applied hot, in the same way as thin white, not forgetting to cover every part of the frame, dabbing the brush down into all ornamental parts, and getting well into the bottoms.

When this is dry it is again ready for smoothing with fine emery-paper, which should produce a smooth, even surface, for the frame will not be papered again.

Now attention must be paid to the burnishes. Matt gold-size is mixed and applied three or four times evenly with camel's-hair pencil. When dry, paper with fine emery, and brush off with a damp sponge.

After well dusting, give the frame two coats of clear-coat, moderately strong, touching every portion carefully, as it is intended to keep the next preparation from sinking into the frame, but do not put it on too abundantly. A good way is to squeeze the brush out every time between the fingers before applying it, and the frame will receive a thin level coat all over, without running. When this is dry the work is ready for oil. Take a piece of clean linen rag, and squeeze a small quantity of oil gold-size on to a piece of glass; then with a suitable-sized sash tool (bound round with string if the hairs are long) lay a coat of oil thinly over the surface: the thinner it is spread the better it will be for gilding; in fact, it must not be too thick, or the work will turn out dull when gilded, but cover the frame equally, thinly, and completely, touching every part and missing nothing. This operation is usually performed in the evening, so that it will be in a fit state to gild the next morning. When it is ready will be known by the dry tackiness of the oil.

There must not be the slightest suspicion of greasiness about it, nor yet must we allow it to get too dry, but take it in the humour and at the time. If it is not dry enough, leave it till it is, but do not leave it too long.

Before it is put up to dry (being in oil) over-night, take a piece of damp calico rag, and wipe off with care the grease from the burnishes.

In the morning our frame is examined and found to be ready for gilding. The leaf is blown from the book into the cushion, and cut up to the size and shape suitable to the part under operation. Take up the piece with the tip (which should be brushed across the head to make the gold adhere), place it lightly on the frame, and repeat till every part is covered. The gold is then carefully pressed into the ornament with a dabber of cotton-wool, and skewed or brushed over and over the frame in order to make the gold-dust that rises remedy all defects or parts by accident left uncovered. When the frame is perfect as far as it can be, brush off all superfluous dust, and the frame will shine like the surface of solid gold.

Now give the burnishes (if any gold has adhered to these take it off at once) two coats of burnish gold-size evenly laid. When dry, procure a glass of cold water and a camel's-hair pencil, and proceed to gild by floating the bead to be burnished with water, and quickly applying the strip of gold, which must be ready, on the tip. Should any defects show themselves, they must be remedied at once by another application of gold to the already wetted surface. This will be repeated until all the burnishes are covered, care being taken not to run too much water on the gilded portions of the frame.

This completes gilding in oil and burnish, and the flat inside must be seen to after the parts already gilt have been burnished.

The burnisher is made of agate stone in numerous sizes and shapes, the most convenient being curved, with a point that will fit into hollows and curves that require burnishing. A little practice will be better than a volume of description as to the method of using them; however, a few words will not be out of place on this subject.

Hold the handle firmly in the right hand, and with the left put slight pressure on the burnisher, and apply the curved part to the bead or the point to the hollow; keep it steadily upon the work, and draw backwards and forwards until a brilliant burnish is produced.

Now carefully overhaul the frame, and if any faults occur, be sure to remedy them before going any further. Then finish sizing, or ormolu size the frame all over except the burnishes, which must be religiously excluded from this operation.

The inside flat may consist of flat and hollow or flat and bevel, and may be burnished in the hollow or matt, according to taste.

Flats are double gilt, unless economy is the object. Double gilding gives solidity to the work in hand, and at the same time does away with any appearance of inequality where the leaves join.

The mitres may require rubbing down with glass-paper, the hollows or bevels stopping with putty if badly joined or damaged. When smooth, apply a coat of clay, emery-paper when dry, and apply four coats of matt gold-size; again emery-paper, and wash down with a sponge and clean water. When very nearly dry, use a piece of cloth, and briskly rub the surface until it assumes a brilliant polish. Upon this lay two coats of weak size (when cold it must not be strong enough to set), and allow to dry. Prepare to gild as before with camel's-hair mop and glass of water, keeping the gold from the hollow if it is to be burnished. When dry, wipe off the superfluous gold with a piece of soft wool. The faults will now probably be enormous, but the next coat will remedy that. Lay one coat of weak size over the gold, and two coats of burnish size in the hollow. This, when dry, must be again covered with gold, laying flat and hollow together. Again rub off with wool. Should any faults be visible, wet the place with mop, and put a small piece of gold over till all defects are made good. Burnish the hollow without slipping over the flat, and finish sizing the flat without the hollow. The frame will now be complete.

Re-gilding.—Old frames that require re-gilding undergo the same preparations as new work, with the exception of one or two little details.

If the frame is in good condition, make a bath of soda-water, and with a brush wash every part of the frame free from dust and grease, and wherever possible strip off the old gold without undermining the composition or whiting. When dry, stop up every crack, and proceed as with a new frame.

Should the ornament be broken away, it will have to be replaced. If small pieces only are missing, use a piece of glue, putty, or compo. applied and modelled as near to the shape as possible; if large pieces, a "squeeze" must be taken. Place a piece of compo. over the steam from a saucepan to soften, knead it up like dough with whiting, and proceed to take a squeeze from a perfect portion of the frame. First grease the part to be reproduced, then place the compo. over it, squeezing it into every part of the ornament; take it off, and put away till dry and hard. To take the required impression, grease the mould and press soft composition into it, wet the back, cover it with a piece of board, and apply pressure to force the compo. into every part; then loosen it from the mould, and it will come away with the board. When partly set, cut away the required ornament with a knife, place it on to the frame in its proper position, and back up with compo., smoothing all down in a workman-like manner.

Oak, if well selected, will make a good gilding surface to show the grain. After well glass-papering, give it two coats of methylated French polish and put in oil as described above. After gilding, finish sizing.

MASONS' WORK.

BY MUNIO.

DAMP COURSE — FOOTINGS — VARIOUS KINDS OF WALLING — RUBBLE, BLOCKING, AND ASHLAR WALLING — POINTING — DRESSING STONES: PLAIN, CIRCULAR, SUNK, MOULDED, CIRCULAR MOULDED, AND SUNK AND MOULDED WORK.

Damp Course.—As soon as walls are brought up to the surface of the ground, a damp-proof course should be laid on, to prevent damp arising in the walls; this may be of asphalte, about ½ in. thick, laid on hot, or it may be a course of slates bedded in Portland cement, with the joints overlapping each other. A damp-proof course of glazed stoneware is also sometimes used; this is made about 3 in. thick, with perforations through it, and also acts as a ventilator under wooden floors; the damp course should be thoroughly set before being built upon.

Footings.—Footings are large stones laid in the foundations of walls. They should, when possible, be in one stone, and should be at least 3 in. wider on each side than the wall which comes upon them; they are from 3 in. to 6 in. thick, and are pick- or hammer-dressed. They should be bedded down perfectly solid; sometimes two courses of footings are used, the lower course projecting at least 3 in. on each side beyond the upper course. When they cannot be got the full width in one stone, they may be laid as shown in Fig. 30; when they are laid in two courses, they may be bonded as shown in Fig. 31.

Various Kinds of Walling.—There are many different kinds of walling, but they may be briefly summed under three heads—viz., Rubble or Random Walling; Blocking, or Block and Course; and Ashlar Walling.

Rubble Walling.—In this walling the stones are not made to any particular size, but are roughly bedded, and the sharp angles knocked off with the hammer in walling; a thin stone is laid under the tail of the stone, called a "pinner," and the stone hammered down on the mortar; the pinner gives the beds of the stones a slight inclination outwards, which prevents the wet running into the wall. In the Lake District, where rag walling is used, this inclination is made much greater, and the stones are said to be "watershot;" this is to prevent the heavy rains from beating through the wall; for the same reason the mortar in these walls is kept back from the face of the wall, giving it the appearance of being built without mortar, as, if built in the ordinary way, the mortar would be washed out.

A sufficient number of throughs or bond-stones should be inserted in the wall—about one in every 6 ft. of area; and those in one course should be laid between those in the course below. The bond-stones should not be left projecting out of the walls, as they are liable to be broken in cutting off the ends. Fig. 32 shows rubble walling; the large stones at the angles are called "quoins," and are generally hammer-dressed. Fence walls for fields are built in dry rubble, or without mortar, except a row of bond-stones laid in mortar in the centre of the wall; and the coping, formed of stones set on edge, is laid in mortar. These walls are built with a batter or slope on each side.

Blocking.—Blocking is formed of stones reduced to parallel courses. The faces are hammer-dressed, pitch-faced, or drafted and broached, the quoins being dressed in the same manner. They are walled, and throughs inserted, in the same manner as rubble walling; the inside of the wall is generally rubble work. Fig. 33 represents blocking walling. Sometimes the blockers are walled in varying courses, called "sneck walling," as shown in Fig. 34.

Some excellent blockers are obtained from the Yorkshire and Durham flag quarries; they are from 2 in. to 6 in. thick, with parallel beds; the faces are pitched; they are called "flag blockers" or "parpoints."

Ashlar Work.—This is formed of stones about 12 in. thick. The faces are pitched, drafted and broached, tooled, or polished; the inside of the wall is faced with rubble work or brickwork; the beds and joints are dressed with the mallet and chisel, and they are set with fine putty; bond-stones or throughs should be inserted as before named, and when openings for windows, etc., occur, every alternate stone should go through the wall; the facing-stones should also be of

varying widths, a narrow-bedded course being set on a wider-bedded course to give a better bond to the backing of the wall; the joints should be made square for at least 2 in. from the face, after which they may gradually widen out. The stones should always be set on their natural or quarry bed. Fig. 35 shows ashlar work.

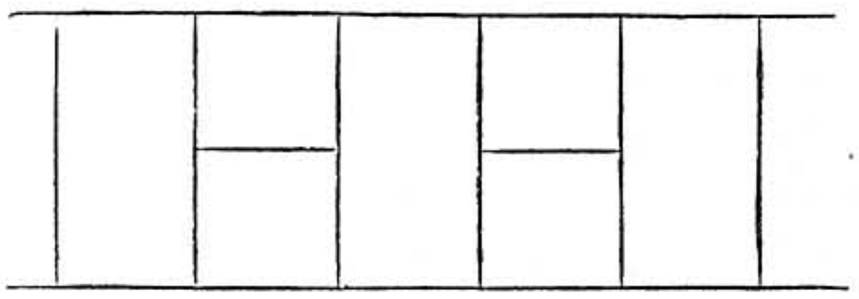


Fig. 30.

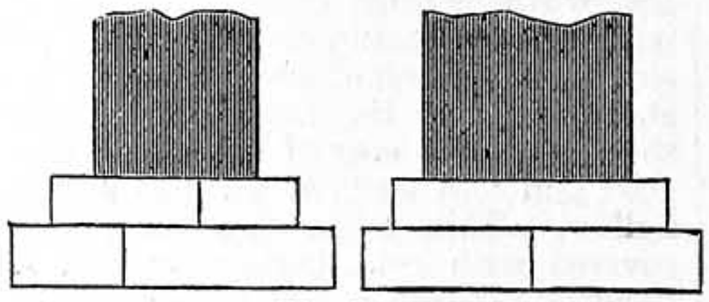


Fig. 31.

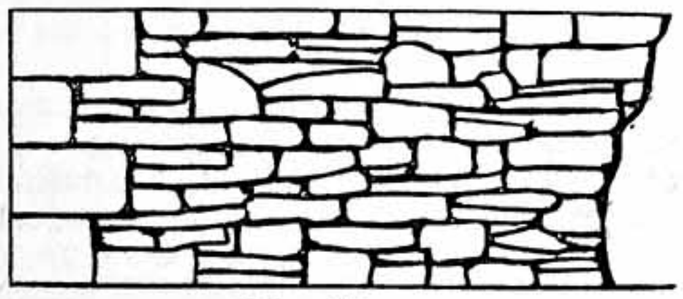


Fig. 32.

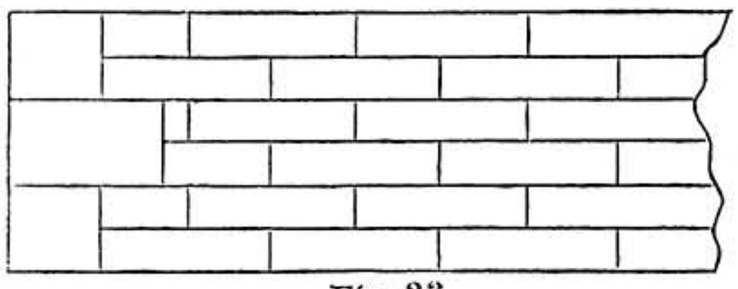


Fig. 33.

Sometimes the edges of the stones have a small chamfer formed round them, as shown in Fig. 36. This is called "Rustic" or "Rusticated Work." Sometimes the quoins only are rusticated.

Another method of finishing the face of ashlar work is called "Rock Work." This consists in sinking the face of the stone (after it has been dressed level) into various irregular forms, with a narrow flat margin between them, the sunk portion being about ¾ in. deep.

Pointing.—Pointing consists of filling up the joints of walling with fine mortar, to prevent rain from injuring the wall. The simplest method is called "raking off" or "dashing." In this the joints are filled with mortar, and raked level with the edge of the trowel. Sometimes a stiff brush is rubbed over it, to level the work; this is used on rubble walls.

Lean Pointing.—In this the joints are filled with mortar, and the trowel is drawn along to smooth it, slightly pressing the top edge inwards; the lower edge is sometimes cut off to a rule, and sometimes with the trowel-edge only. This pointing is used in blocking and rubble. Rock or pitch-faced work is pointed with a jointer with round edge; the joint is filled with mortar, and the jointer drawn along the edge of a rule. *Tuck pointing* is also used in blocking. In this the joints are filled with mortar made to the colour of the stones; this is smoothed over, and when sufficiently stiff a joint of white putty is laid on with a flat jointer by means of a rule. The filling may be made the colour of the stones by mixing it with sifted smith's ashes and stone dust till of the required colour. The putty must be well beaten, to get all the water out of it, and mixed with silver-sand and oil; the joints must be gauged to keep them parallel, and the edge of the rule is rebated to allow the putty to fall down as it is cut off; a knife with the end slightly turned up is used for cutting off the putty joint; the cross-joints are cut off with a piece of wood shaped into a set square, and a handle fixed on the face. The joints are made from $\frac{3}{16}$ in. to $\frac{1}{4}$ in. wide.

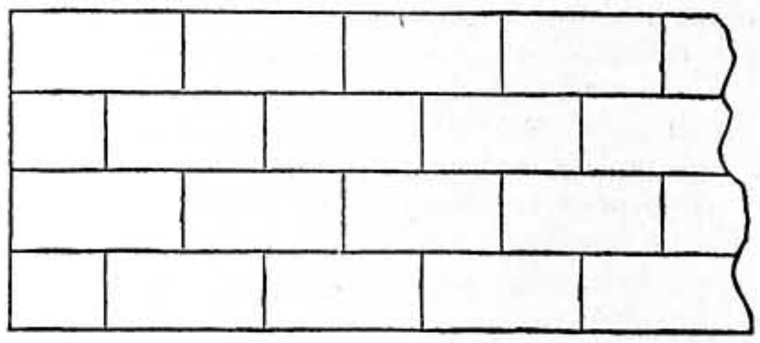


Fig. 35.

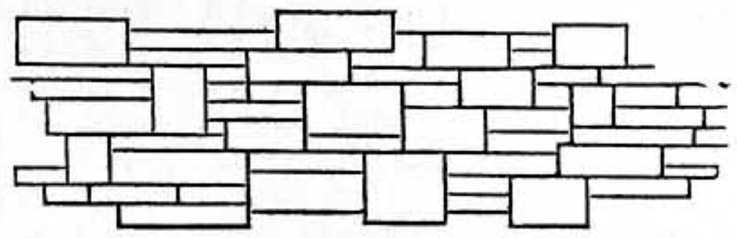


Fig. 34.

Before commencing to point a wall, the joints should be well raked out, the dust brushed off, and the wall damped, as the pointing will crack if laid on a dry, dusty wall.

Ashlar is pointed with fine putty mixed with stone dust; the joint is filled level, and the edge of the trowel drawn down the centre of the joint with a rule. Ashlar work should be washed, and the lime-stains scraped off before it is pointed.

Dressing Stones.—Dressing stones is the art of cutting the stones into the various forms required in building. It is designated as Plain, Circular, Sunk, Moulded, Circular Moulded, and Sunk and Moulded Work.

Plain Work.—Plain work consists of forming the surfaces into planes. To level the surface of a stone, a draft is run along one side and across one end with a 1 in. chisel; a rule is fixed on the cross-draft, and a draft is run across the opposite end, which must be cut so that when a second rule is laid upon it, the under edges of the two rules are

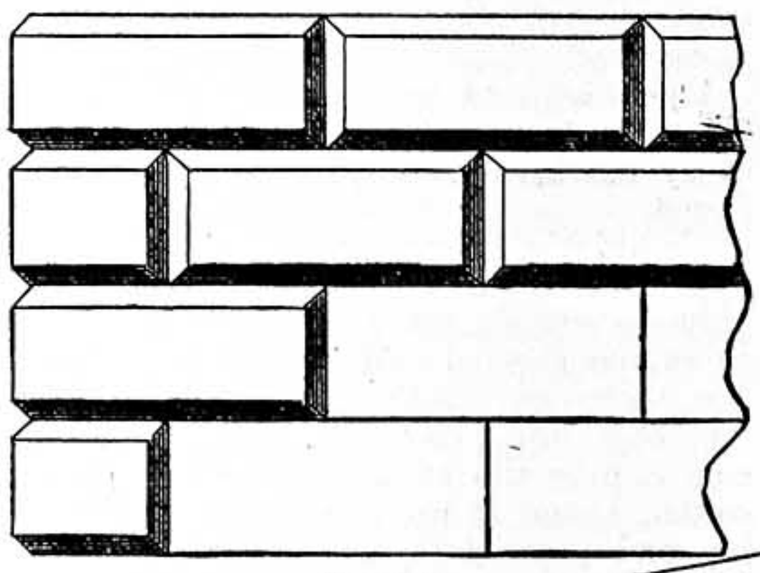
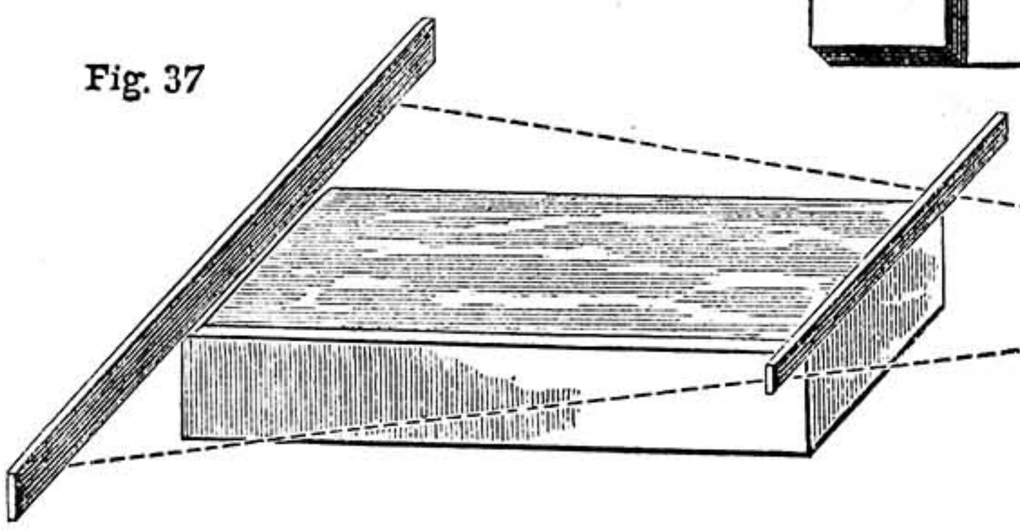


Fig. 36.

Fig. 37



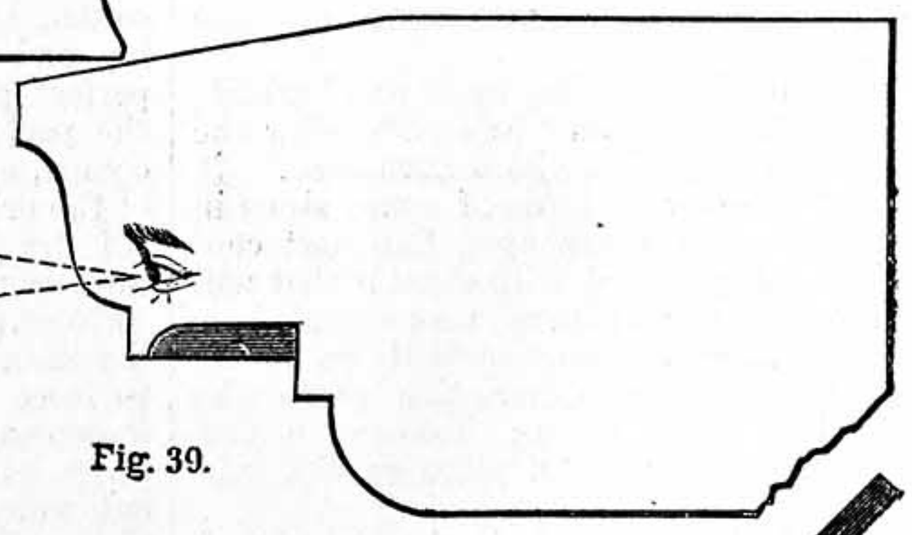


Fig. 39.

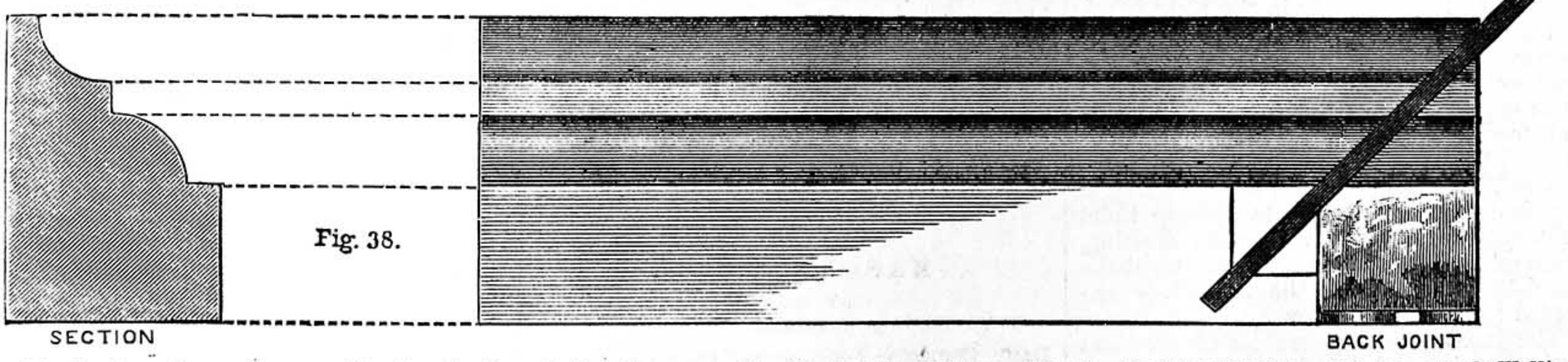


Fig. 38.

SECTION

BACK JOINT

Fig. 30.—Footings in one Course. Fig. 31.—Footings in two Courses. Fig. 32.—Rubble Walling. Fig. 33.—Blocking Walling. Fig. 34.—Sneck Walling. Fig. 35.—Ashlar Walling. Fig. 36.—Rustic or Rusticated Work. Fig. 37.—Taking Surface of Stone out of winding. Fig. 38.—Mode of Mitring Moulded Stone. Fig. 39.—Moulded Stone with undercut Portion left unworked.

out of "winding." (See Fig. 37.) Then divide the whole surface of the stone by drafts into spaces 10 in. square, making each draft perfectly straight; the rough stone between these drafts is levelled down with the point, and then straightened with the inch chisel; the surface is then ready for finishing. The remaining sides and ends are squared from the face already dressed. There are various methods of finishing the surfaces of stonework—Boasting, called also "Swin Chiselling" and "Droving" in Scotland. This consists in going over the whole surface of the stone with the boaster, keeping the tool-marks all one width, the sizes varying according to circumstances; but on a coarse-grained stone they are generally wider than on a fine-grained stone. Tooling consists in forming the surface into parallel lines or flutes, which are at right angles to the edge of the stone; a tool 3½ in. or 4 in. wide is used, and the strokes are commenced at the side farthest from the workman, and brought right across the stone towards him. In order to keep the tool straight, square lines are drawn at intervals across the stone. Polishing consists in rubbing the surface with a level stone, fed by sharp sand and water; the stone is rubbed with a circular movement, and care must be taken not to rub the surface into hollows: the rubbing is continued till all the tool-marks are obliterated.

Drafting and broaching consist in putting a draft round the edge of the stone, which is gauged about 1 in. wide, and struck in; the centre portion is levelled down by the point, and dotted over till perfectly level by the stone-pick or diamond-hammer.

Rock or pitch-faced work is struck off round the edges, and left with the natural face of the stone; sometimes a draft is run round the edges of the stone, and struck in parallel.

Circular Work.—In circular work the face or bed, as the case may be, is first reduced to a plane surface; the mould is then laid on this surface, and cut in; the remaining beds or joints are then squared from this surface. In applying the square to the joint of a circular stone, it should be held at right angles to the line of the joint.

Sunk Work.—In sunk work the margin of the sinking is first reduced to a plane surface; the sinking is then marked on, and cut in at each angle, using a gauge for the depth; drafts are then run between each point thus cut in, and the surface levelled to these drafts.

Moulded Work.—In moulded work the beds, joints, and as much of the face as is not moulded, are first reduced to plane surfaces; the mould is then marked on each joint, and cut in, and the intervening stone is then cut away, using the straight-edge for testing the work. When a return or quoin occurs in a moulded stone, it must be mitred in the following manner:—The mould is formed on one face, as already described; then work a back joint on the head end of the stone, and cut in the mould, and draw square lines from the top and bottom member, intersecting the mould already worked; and at the angle of intersection draw a square, the sides of which are 4 in. long; also draw a diagonal across the square, and lay a rule on the diagonal line, projecting to the outside of the stone; then, sighting the edge of the rule with the outside angle of the moulding, draw a line across the moulding coinciding with the edge of the rule, which will be the line of the mitre (Fig. 38); this line can also be checked by gauging. Should any part of the moulding be undercut, it must not be worked till after the return portion of the moulding has been worked, but is worked afterwards to a reverse mould; in Fig. 39 the shaded part is left till the return end is worked.

Circular Moulded Work.—In circular moulded work the stone is first worked to a circular form, as already described; the mould is then marked on the joints, and cut in, and the moulding is worked to circular rules, one being required for each member of the moulding.

Sunk and Moulded Work.—In sunk and moulded work the plain sinking is first worked at the inside of the moulding; a reverse mould is then applied, and the moulding cut in at each side, and worked by means of a rule; the mitres are formed by drawing lines, intersecting each other at the angles, from the portion already worked, and the working tested by a rule cut to an angle of 45° at the end.

MANTEL-BOARDS: HOW TO MAKE AND FIX THEM.

BY H. HINGE.

WOOD, ETC.—WORKING AND SHAPING—DOVETAIL KEYS—COVERING, FRINGES, FANCY NAILS, ETC.—FIXING, ETC.

THESE very desirable additions to our chimney-pieces can be easily made and

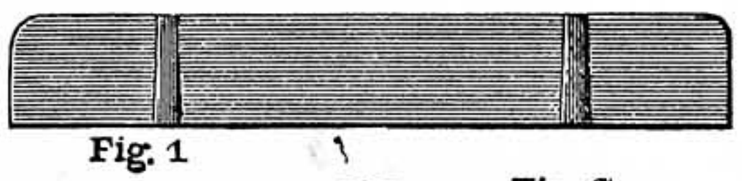


Fig. 1

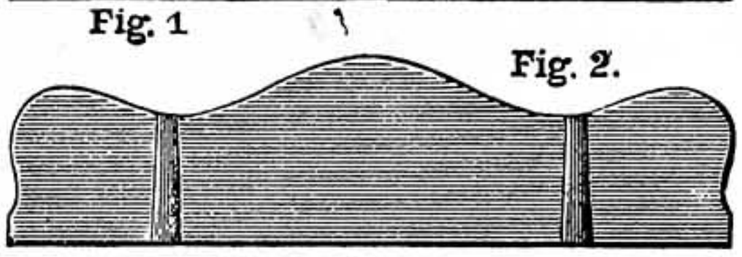


Fig. 2.

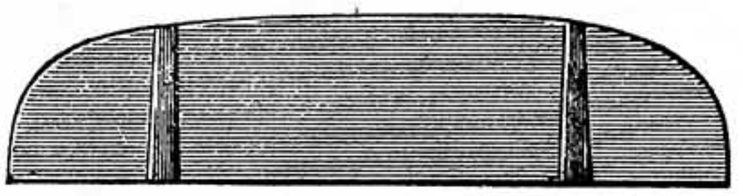


Fig. 3.

Fig. 5. Fig. 4

Fig. 1.—Plain Mantel-Board, showing Underside, for Bedroom. Fig. 2.—Shaped Mantel-Board for Sitting-Room. Fig. 3.—Alternative Mantel-Board for Sitting-Room. Fig. 4.—Enlarged View of Dovetail Key. Fig. 5.—Section of Ditto.

fixed by anyone who has a few tools and a desire to use them. The size, of course, must be ruled by the width of the chimney breast, size of room, etc., but generally, almost all chimney-pieces will admit of a mantel-board 3 in. or 4 in. longer and wider than the existing one.

Wood, etc.—The wood for the purpose should be good and dry. It will be easily understood that if it is not fairly dry, the heat of the fire and general dryness of the situation will cause it to split and twist, and spoil the looks of it.

Working and Shaping.—Procure a fair piece of deal the length and breadth required, and not less than 1 in. thick. Plane up true and straight on both sides, and then determine what shape to make it. Fig. 1 shows a board with only the corners rounded, suitable for a bedroom. Fig. 2 is the best shape for drawing- or sitting-room, and looks very well. Fig. 3, another shape, not so much used as Fig. 2. Having decided what shape to make it, measure to the centre of the board, and make a square mark across it, and then begin, and with a pencil sketch the shape you want, putting on a little or taking off (after the outline is got) until the desired shape is attained. Now cut it out with a bow saw and mark it on a paper; cut this out, and lay it on the other half, and mark it and cut it out; you will then get both sides true.

Dovetail Keys.—We must now put in some dovetail keys to keep the board flat and true. These are made of ¾ in. oak or mahogany, or other hard wood, about 2 in. longer than the board is wide, 6 in. from the end. They should be about 2 in. wide at one end, and taper down to 1½ in. at the other end. Besides being tapered in the length, the edges are bevelled to form a dovetail. Fig. 4 shows a dovetail key, and Fig. 5 section of the end of key. These are to be fitted tight into the mantel-board. The best way to fit these will be to get and place them the narrow end and narrowest side down in the place we want them to come, and then mark with a sharp pencil along the edges of the key. These should be cut with a sharp saw on the bevel to match the shape of the key to a depth of ½ in., and cut out with a chisel, care being taken that the groove is of a uniform depth right through. Now see how the key fits, and if it has been done right, it will just drive in tight. If it is too tight, plane a little off the edges of the key; but be sure it fills nicely, or it is of no use. When both keys are fitted, they should be marked about ¼ in. shorter at each end than the board is wide, carefully driven out again, and then cut off to the marks with a saw. They should only be glued about 1½ in. at the narrow end (which comes to the front of the shelf). The glue is best put in the groove, so that when the key is put in no other part will get glued except the end. These are now planed off level with the board, and, if done right, will admit of the board shrinking without splitting or becoming unlevel. In a long board put in three keys, one at each end and one in the centre. Take off all sharp edges after the shaping is finished.

Covering, Fringes, Fancy Nails, etc.—Cover with crimson or green cloth, or any other colour harmonising with the surroundings. This is easily done by tacking the material to the back edge of the board first, and bringing it over the top side, and just pointing in a few tacks to keep it in position, and slitting the cloth anywhere out of sight to facilitate it fitting the shaping, and pulling it down, taking out the tacks that were pointed in as we go along, and pulling it tight and tacking it on the underside of the board. If carefully done, it will present a nice level surface, and fit the shaping, and leave no wrinkles anywhere. If a fringe is going on to the front edge, it should be backed by a piece of the same material as the shelf is covered with, about 2 in. narrower than the fringe. This is tacked along the front edge, not pulling it tight anywhere. If we do, it will be pinched at the corners, and not fall nicely. The fringe is put on in the same way, turning a little under at the ends to prevent it roving. It must now be finished along the front edge with fancy brass nails put in at equal distances of about 2 in. or 3 in. This is best done by setting out with a pair of compasses. It will be found that the brass nails all require boring for with a fine sprig-bit, as they will bend and be disfigured if they require much driving in. Macramé work makes very good and durable fringes.

Fixing, etc.—Our mantel-board is now

finished in itself, and only requires fixing. If the chimney-piece it is going on is wood, there is no difficulty; it simply wants screwing down from the underside. If it is iron or marble, we shall want two rebated pieces of wood to clip the underside of mantel-shelf, and screw to the underside of the board. These can be made by screwing two pieces of wood together, one the thickness of the shelf, and allowing the other piece to stand over about ¾ in., and then screwing right through both pieces into the shelf at the right distance from each end, so as to clip the bottom shelf. If fixed in this manner, it can be taken off at any time to clean, etc., by simply sliding it off.

A USEFUL HAT OR CLOTHES STAND.

BY T. S.

Many readers of Work have changed their residence some time or another, and, on changing, have doubtless found that the old cornice poles, which had been well suited to the old house, were either too large or too small for the windows of the new residence, and thus have been led to put them away in the loft, and buy new poles. It occurred to me that a good stand could be made from one. This I have made, and hope the description will be useful to others. I had a piece of a good mahogany pole cut off a long one when I last moved, with the knobs at end, and I made a three-legged stand for it, screwed on some brass hooks that were also the result of a "move," and I find it

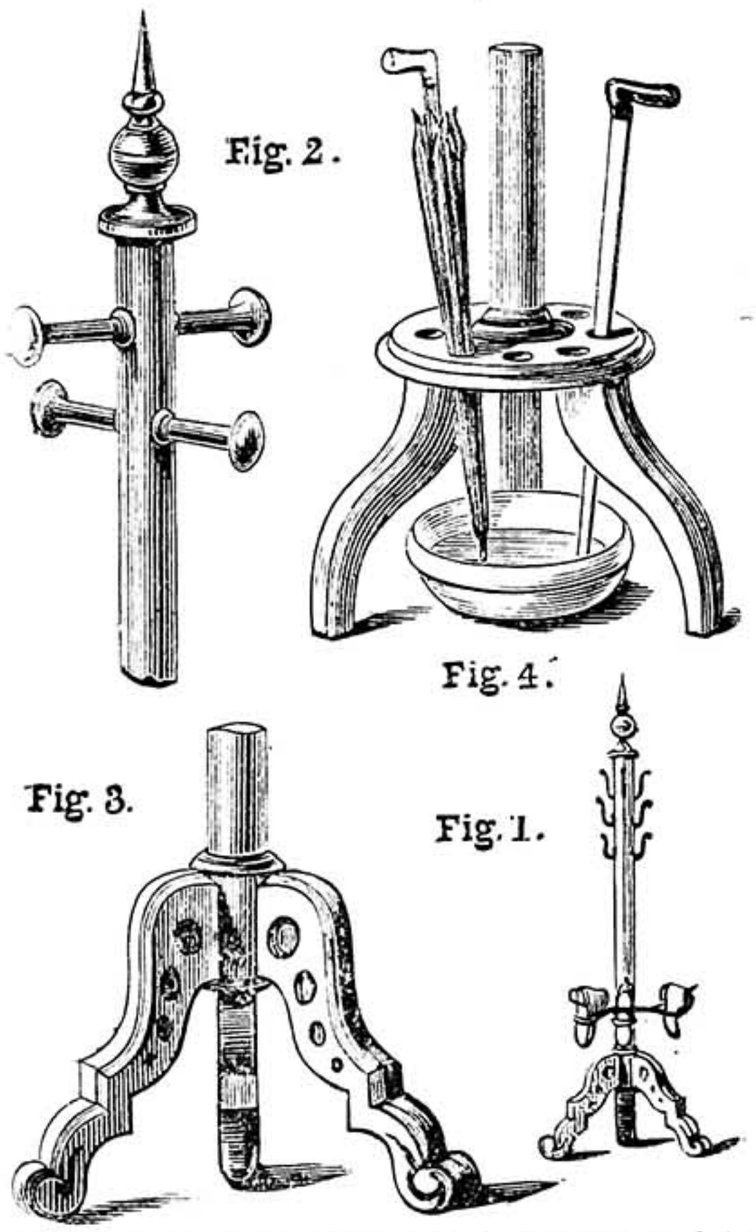


Fig. 2.

Fig. 4.

Fig. 3.

Fig. 1.

Fig. 1.—Sketch of Hat or Clothes Stand complete.
Fig. 2.—Enlarged View of Top with Pegs.
Fig. 3.—Enlarged View of Bottom or Foot.
Fig. 4.—Adaptation of Bottom for Sticks, Umbrellas, etc.

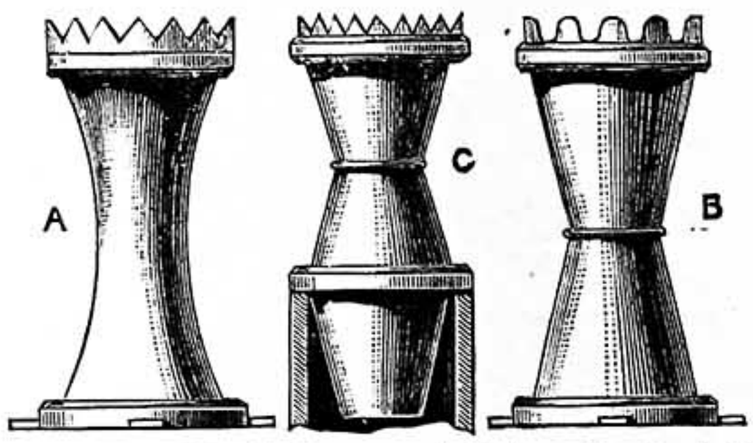
most useful. It stands in a corner, and my clothes hang on it when I am in bed, instead of across the foot of the bed. Thus they get nicely aired, and are put on with pleasure in the morning. This stand also avoids disfiguring the door of bedroom with hooks, and could be made to stand in the corner of a landing or hall, where any other stand could not be placed. Mine is 4 ft. 6 in. high, and has a foot like a three-claw table or music-stool; but if a rather longer pole is used, the three claws could be screwed to side of pole, and the lower end of pole stand on the ground, or be finished with a knob, like the top. The claws could be cut and shaped out of stuff from 1 in. to 2 in. thick, taking for a pattern any table or music-stool you can get at. A reed or moulding could be scratched on the edges, holes sunk in the sides by a large centre-bit, etc. Fix to the pole by one screw through the top part of leg, and one through the pole between two opposite legs. If you have a lathe, you may turn the pins and the base; but if not, brass hooks, or even black iron hooks, would do. The feet should be about 18 in. apart to get a good base, or the stand will be top-heavy. The lower part could be made with holes to take boots or slippers. The top knob takes the hat.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any-one who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

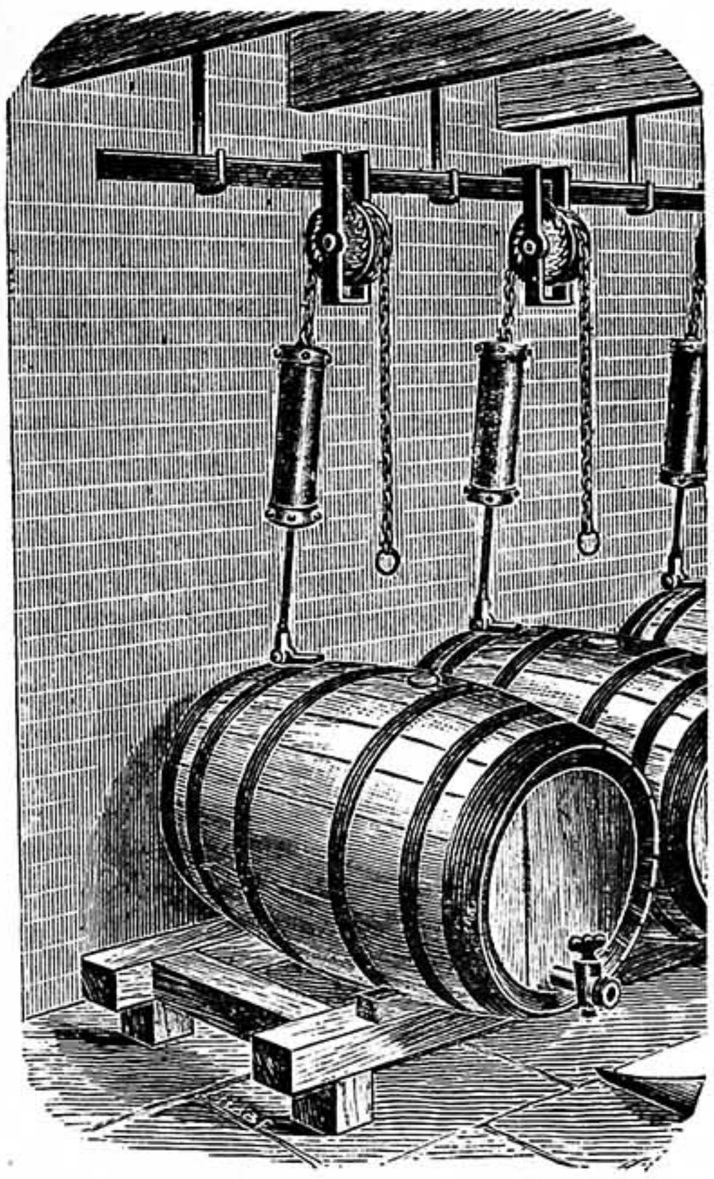
41.—Mitchell & Hare's Improved Pot or Cowl.

In the summer, when the fires are over and the chimneys swept, and ready for the winter when it



Mitchell & Hare's Improved Pot or Cowl—A, B, Ordinary Cowls; C, Cowl for Stove.

comes round again, persons who are troubled with chimneys that smoke will be taking the necessary precautions to prevent, if possible, a recurrence of the nuisance. In the next number of Work an expert, who writes under the *nom de plume* of "Excelsior," will show us how he manages to do this by judicious alterations of the throat of the chimney just above the grate or fireplace; and in this number, Messrs. Mitchell & Hare, Bedale, Yorkshire, or 10, Chesson Road, West Kensington, show us how it may be prevented by placing a suitable pot or cowl at the chimney top. The form of "The Comfort," the improved pot or cowl by which this desirable result is attained, is shown in the accompanying illustration, in which three shapes are shown, of which two, A and B, are intended for placing on ordinary chimneys; and C, for stoves. The principle of the invention consists, as may be seen, in making the pot narrower in the middle, either concave, as in A, or tapering, as in B and C, and wider at both top and bottom. This, Messrs. Mitchell & Hare say, tends to prevent down draught and the ill-effects arising from it, as the contracted or narrow part acts as means whereby the force of the downward draught becomes broken and gradually expended, and the up draught improved. The manufacturers consider B to be the best shape. They send me a copy of a letter from Messrs. Garlick & Horton, Limited, Builders and Decorators, 43, Sloane Street, London, S.W., to this effect:—"We have much pleasure in informing you that we have fixed your 'Patent Comfort Cowls' to a number of houses in this neighbourhood, and found them a success in preventing down draughts in some very bad flues, and shall be glad to recommend them." The price of "The Comfort" Cowl in galvanised iron is 21s.; and in earthenware or pot 15s. and 10s. 6d.



Thomas's Patent Cask Tilter.

42.—Thomas & Sons' Patent Cask Tilter.

When a cask of ale or beer is getting low, it often happens that the liquid remaining in the cask is seriously impaired and rendered "muddy" by shaking up the dregs in tilting it. To obviate this, Messrs. Thomas & Sons, Acme Hoist Works, Cardiff, make and supply a patent cask tilter, known as "Walker's Patent Cask Tilting Apparatus," which appears to form an improved and handy appliance for automatically tilting barrels and casks without disturbing or shaking up their contents. It is said to be light, portable, and simple in construction, and such as can be easily and quickly fixed. Its principle is apparent from the accompanying illustration, in which it is shown attached to the first, second, and third of a goodly row of barrels in a capacious cellar. First of all, hooks are attached to the joists, in order to give support to a rod of iron, on which as many cask tilters are hooked as there may be barrels. The portion of the apparatus hooked on to the bar consists of an iron frame carrying a ratchet wheel and a pawl, which engages in the teeth of the wheel as it revolves, and prevents its return in the opposite direction. Over the wheel passes a chain, free at one end, and attached at the other to a cylindrical case, in which is a spring. At the lower end of the case is a hook of special form, by means of which a firm and instantaneous grip is obtained on the rim of the cask when the hook is attached to it. To set the Cask Tilter, the hook is fixed to the rim of the barrel, and the chain is pulled until the spring inside the Cask Tilter, as the cylindrical case is called, is compressed flat. The apparatus is then ready for work. As the liquid is withdrawn, the spring gradually returns to its normal position, and, in doing so, tilts up the end of the barrel without the slightest shock until it is empty. When empty, the pawl is released by pulling a string attached to it, and the cask immediately runs back to its original position. The price of the Cask Tilter, which is said to be suitable for barrels and casks containing any quantity up to a hundred gallons, is 17s.

The Editor.

SHOP:

A Corner for Those who Want to Talk It.

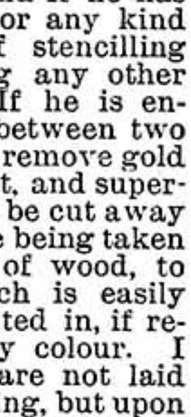
*** *In consequence of the great pressure upon the "Shop" columns of* Work, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of Work *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Gilding on Glass. — Blinker writes:—"I fear that Young Signwriter will not find H. L. B.'s instructions (No. 112, present Vol.) in every point satisfactory. By his use of the terms 'inside' and 'outside,' H. L. B. would seem to have a *window* in his mind (an excellent thing, by-the-bye, facilitating enlightenment). Now it is obvious that our young friend will never be able to paint a clear, sharp letter on a vertical surface (rather a mixed expression that; but never mind) with a size so thin and fluid as is used in this process. Even were his glass laid flat, its evenness would offer irresistible temptations to the size to indulge in frisky little excursions on all sides. I have never seen the thing attempted in this way, and, having a horror of bad language, I never want to. Let Young Signwriter lay on his size—which is not expensive, for the spirits of wine may be dispensed with—liberally, and when it has drained to a thin film, cover all that part of his glass where lettering occurs with leaves of gold neatly laid to overlap each other the 'laste taste in life.' This must now drain and dry, dryness being indicated by the disappearance of the minute irregularities which make the gold look 'mat' and the reappearance of burnish. While this process is going forward, Young Signwriter cuts a stencil or stencils (hints have appeared in Work), which will cover the gold that is to *remain* on the glass, and expose the *superfluous* to the action of a stiff but not harsh brush, as a nail-brush. The stencils may be made in stout paper of hard texture (continuous roll preferred), and as they are not to be roughly used, they will serve a number of times, though thin stencil metal will be better. Young Signwriter need not be told that it is practically impossible to *paint* a letter so clear, sharp, and altogether lovely, as can be produced by stencilling of this kind, even though he used a much more workable size than this, which is hardly more than water; and if he has a number of tablets to be lettered, or any kind of repeating to do, the advantage of stencilling—not to say the absurdity of using any other method—will at once be apparent. If he is engaged on plain lettering which lies between two (imaginary) right lines, *one* stencil, to remove gold from *between* letters, will be sufficient, and superfluous gold from tops and bottoms can be cut away with—a match-stick, for instance; care being taken to lay the straight-edge across slips of wood, to prevent contact with gold-film, which is easily damaged. Shading may now be painted in, if required, and the whole backed up any colour. I should have mentioned that stencils are not laid upon a board during the process of cutting, but upon a piece of glass—*not* the piece being decorated, of course, but a waste piece which does not object to being scratched. You cannot obtain a clear cut on any yielding or uneven surface. Lead is sometimes used for this purpose, but it has a way of holding the point of your knife, and is altogether unsatisfactory. Zinc is better, and polished iron or steel is almost as good as glass; but I need not trouble to say so, as our young friend will probably have as easy access to the latter as to any of these substitutes."—[This is valuable information, and evidently written by a practical man. I have seen work done in this way, and can thoroughly recommend the process. I am obliged to Blinker for kindly supplementing my instructions.—H. L. B.]

Spanner. — W. E. (*Liverpool*) writes:—"Some time ago I was working with a man who was a good engineer. He came to put some 1 in. steam piping, and had forgotten to fetch his pipe tongs. He said he was not much concerned about them, he could screw up round piping with a square spanner, which he did, and made a good job of it. He got a spanner a little bigger than the pipe, and inserted a bit of a rat-tail file between the pipe and jaw of the spanner, which held the pipe, I think, better than tongs would. I enclose a rough sketch—A is a bit of rat-tail file; B shows the pipe."



Spanner.

Bicycle Parts.—Messrs. W. A. Lloyd & Co. (*Birmingham*) write:—"We have been inundated recently with applications from amateurs for our price list, and we find it is largely owing to the article appearing in your journal of May 30th, on 'The Construction of the Safety Bicycle,' in which our name is mentioned as one of the firms where parts, etc., may be obtained. We shall be very glad if you can find space in the next issue of your valuable paper to say that we can only supply the *actual 'cycle trade'* with fittings; and if any of your readers require our goods, they can be obtained from any cycle agent in the country. We may say it is evident your paper must have an enormous circulation, as the applications have been very numerous indeed, and have come from all parts of the kingdom."

II.—Questions Answered by Editor and Staff.

Celluloid on Piano Keys.—Leicester.—Take the keys off the frame. Now get a level board to lay your keys on, then glue two strips of brown paper on the two top edges of the board; then put a spot of glue on the underside of the key back and front, and glue to the strips of paper, placing them in their natural position, leaving the sharps out. Having taken the old ivory off, tooth the tops of the keys. Now tooth your celluloid well, and saturate the side you have toothed with methylated spirits. This softens it. When the spirit has evaporated, you are ready to glue with ordinary glue. I should advise you to lay it in four pieces. You will require a caul made hot. Now glue carefully, and press with handscrews and leave to dry. You will find that you can easily separate it from the paper; then turn over, and cut apart with a fine saw. Where the sharps fit in, cut with saw across, then with a knife from underside cut the piece out, finish with file, and polish with bath-brick and paraffin or spirits and whiting, and plenty of friction.—T. E.

Sticker Action.—Repairer.—The action you speak of is what is known as the "Sticker Action." Remove the stickers from the levers, and take the hinges from the butts; number with pencil each one, so that they go back in the same place. Pull the old hinges out of groove with a pair of pliers. To re-hinge, obtain fawn-skin sticker hinge (it is 1 in. wide), bend in middle, and strike with a hammer, holding it on a piece of iron, and form a hinge smooth side out. Cut into lengths sufficient for six, glue the groove, and press leather in with a piece of thin steel; a stay-busk makes a useful tool for this purpose. You may re-cover levers with fawn-skin cut to the width you require, and glue on top first and allow to dry; then pull tight round and glue on the underside, and hold in position with hammer springs. Now slack the screws in the hammer rail, and take out the centre wire with the butts on. Take off the butts, and remove old bushing. Obtain a set of bushing cloth and point the ends, and glue and allow to dry. This makes a point to thread with. Now thread the cloth in the butt, leaving a small portion hanging out. Glue this, or use shoemakers' paste, and draw level with side of butt, and cut with knife; when dry, broach for centre wire. If you now put the centre wire in, and fix the hammers in the rail, you can re-cover them. Remove the felt by cutting across the front of the hammer with a sharp knife (only cutting the outer covering), and tear off. Obtain a strip of felt, and after tapering the edges down with a knife, cut the felt across a shade wider than the hammer-head. Glue the top side first, and put a spring on each, and allow to dry; then pull felt firmly over, and glue underside; fasten with spring and allow to dry, when you can trim the sides. Do not glue the front of the hammer. Use a shoemaker's knife, and sharpen on emery-cloth. If you do not cut the sides of hammers very nice at first, press between two warm flat-irons. Obtain a strip of damper felt, and cut to the width you require, and glue on, holding with a spring until dry. To put new vellum in levers or dampers, saw slightly across just behind hinge, and open with a knife; take out old vellum, and having prepared your vellum by gluing both sides and allowing to dry, place in the groove, damp the wood, and hold a warm iron on it. This will soften the glue on the vellum. Now put spring on, and allow to dry. You may now put your stickers in their place. Lay the action down on your bench, and glue the bottom of sticker and hinge at one time. Put the bottom on the lever, and hinge on the butt, and with a sticker hook press the leather on the butt front and back. After stickers are dry, ease them backwards and forwards—not too much, only what is necessary when in the piano. The materials for repairing action you can obtain from Hallpike, 213A, Mare Street, Hackney, London; the tools from G. Buck, 242, Tottenham Court Road. Ask for pianoforte maker's special price list.—T. E.

Cost of Copper Sheets.—Anxious.—I find that a sheet of copper ⅛ in. in thickness, and 4 ft. long by 2 ft. wide, weighs about 36 lbs. As there are eight square feet in a sheet of this size, it therefore follows that the weight per foot super. is 4½ lbs. The retail price of copper, varying, according to the market, from 1s. to 1s. 3d. per lb., you would find very expensive to use, a sheet of the size stated above costing about 35s.; though, if you are in the metal trade, or could get anyone in the trade to get it for you, there would, of course, be a good discount off retail price.—R. A.

Tinners' Mixture.—F. H. (*Birmingham*).—I am not aware of the existence of the mixture you ask about for darkening the colour of tin. If, as you say, it is a tinners' secret, you may depend upon it that it is only to be got by paying for. As you appear to have the opportunity of seeing it used, could you not get hold of a little, and submit it to analysis? or if it is of value to you, as I suppose it is, ask the users of the mixture their terms for imparting the secret.—R. A.

Scenic Artist.—Work.—Consult the *Era*, theatrical newspaper. You will find scenic artists and assistants are advertised for weekly. Also study my instructions in Work.—W. C.

Plating Safeties.—F. C. (*Manchester*).—The materials required to nickel-plate two safeties are a floating bath, a battery, nickel, ammonia, bisulphite of soda, and the practical experience of a nickel-plater. The process of plating, you will see, is entirely different from painting black enamel. It is not a painting process, but a dipping and depositing operation by the action of an electric battery. Nickel-plating may, however, be done without a battery, but it would not be advisable for a novice to try even it. The process is as follows:—A porcelain or copper vessel, large enough to dip a handle-bar, is required. Into the vessel is placed a concentrated solution of zinc chloride, diluted with one and a half its volume of water, and heated to boiling. As much powdered zinc as will lie on a shilling is then thrown in, which will coat the interior of the vessel with zinc. The nickel salt, which may be the chloride or sulphate of nickel, is now added until the bath appears green. Now put in some zinc fragments and the articles to be plated, and boil for fifteen minutes. When taken out, wash with clean water, and clean with chalk or jeweller's rouge. If you want a thicker coating, repeat the process.—A. S. P.

Plating.—J. C. (*Wraxall*).—You seem to imagine that nickel-plating is put on with a brush, like paint, whereas it is a process of dipping in a bath charged with nickel, ammonia, etc., under the action of a battery, so that an outfit for nickel-plating one's bicycle is out of the question. Send it out to a professional plater, who will do it for about 10s.—A. S. P.

Size.—Hawk.—I have never used Cognet's patent powdered size, therefore do not know its properties. If you cannot get the ordinary jelly size, and you find the results not satisfactory, get 1 lb. of best treacle, ½ lb. best yellow soap, and, say, 1 lb. of your powdered size; bring it all to a boil, but do not let it boil. These ingredients should be put into 3 quarts of water before placing on the fire. When all is ready, pour this into your soaked whiting, well mixing it. Let it get cold. When cold, it is ready for application. The room being cold and damp would not make much difference, but, I should say, rather depressing for any artistic work.—W. C.

Cost.—Working Man.—I should roughly estimate the cost of such a building as you have described to be worth about 5½d. a foot cube to build. The way you can arrive at the amount is as follows:—Multiply the extreme length of building by the extreme width, and the total by the height half-way up the roof, thus:

Length of building	...	...	36 ft.
Width of building	...	...	38 ft.
			288
			108
Superficial area of building		...	1,368 ft.
Height of building	...	...	12 ft.
Cubical contents of building		...	16,416 ft.
Price per foot cube	...	...	5½d.
			82,080
			8,208
			12)90,288
			20)7,524
Cost of building ...	...	...	£376 4s.

You omit to state the proposed height of building, so I have taken it at 12 ft.—that is, half-way up the roof. In addition to the above, it would cost about 16s. a yard to have the hall tiled. You must distinctly understand that this is, as you suggest, only a rough guess, as you have furnished me with no particulars beyond saying that the situation proposed is four miles from a brick-field, and the little omission I have mentioned above.—E. D.

Transfers, etc.—Engineer.—You can obtain gold transfers from Mr. H. M. Stevenson, 6, Edmund Street, Birmingham, or Mr. W. Gay, 115, Holloway Head, Birmingham. To draw water from the river that runs by your works by means of a lathe seems to me a rather curious proceeding; but if you wish to do it, get a small rotary action pump from Messrs. Warner & Co., Crescent Foundry, Cripplegate, London, and work it from the slow motion of your lathe by means of a gut-line or shaft. The third question on your paper—How to utilise the river for driving purposes—could only be satisfactorily answered by an experienced millwright or engineer viewing the place, and taking all the circumstances of the case into consideration. The data that you give—that the stream is about 11 ft. wide, and runs very swiftly—is not sufficient to form any idea of the place, and space in "Shop" is too valuable to waste in mere conjecture. I should think, from the general tone of your letter, that a perusal of some elementary works on mechanics and hydraulics would be beneficial to you.—R. A.

Marbling. — A Plasterer. — Your letter and drawing give me no idea of the purpose you propose utilising the pedestal for. If it is to be used as a stand in a living room, then it will look best

finished in one plain general colour. It would certainly be a mistake to paint it in imitation of many kinds of marble; the finished effect, especially in the hands of a novice at marbling, would be common and poor in the extreme. I would not, personally, advocate trying to imitate any one kind of marble, save those of a quite general colour. With such an object, wherein the structural ornamentation is a special feature of its value, the veining of marble would detract from the effect of the enrichment, and would destroy much of its delicate form. Assuming it to be a room pedestal, I should paint and enamel it either alabaster colour or as black marble, and enrich it by gilding the caps and cornice blocks solid with gold-leaf. This would look good and rich, and not "cheap and painty." —DECORATOR.

Greenhouse Wash.—B. A. W. (*Croydon*).—Prepare a mixture of white lead paint, made from white lead 1 lb., patent driers 1 oz., and thinned to desired consistency with four parts turpentine to not more than one part raw linseed oil. This must be barely and evenly painted with an ordinary paint-brush upon the outside of glass, and then finished to look like obscured or ground glass by stippling—dabbing—evenly over with either a pad of flannel, soft carpet, or the tips of a larger new dry paint-brush. This paint will not wash off with rain, but you will find that by the time the heat of a summer's sun has been spent on it that it can be removed without much labour, by damping it over and rubbing with a piece of soda, taking care not to have sufficient moisture on the glass to run down and "eat off" the paint from the woodwork. —F. P.

Varnish.—J. T. (*Nottingham*).—Copal oil varnishes are of a more durable nature than polish or varnish prepared from lac and spirits. In the former case, the oil combines with the copal gum to make a film which gets harder with age, whilst the lac has not such aid in spirit varnishes from the vehicle in which it is dissolved. Notwithstanding the foregoing, *any* copal varnish would not suit your purpose, since warmth from handling the rods would probably make them slightly sticky. The most durable and quick hardening covering I could suggest is a white enamel varnish or Bath varnish. Such a preparation is rather expensive, but it has all the advantages of durability given by copal varnish, combined with the quick hardening nature of a spirit and lac mixture. You could not profitably make this. Mander Bros., of Wolverhampton, is the firm you should apply to.—F. P.

Graining Tools.—DECORATOR.—If you want to purchase in any quantities for retailing, etc., write either Messrs. Crowden & Garrod, 62, Southwark Street, London, S.E.; T. Pavitt & Sons, 70, Southampton Row, London, W.C.; or J. Hill, 230, Pentonville Road, London, N. In buying brushes, be willing to pay a fair price; "cheap and good" seldom go together in this respect. If you require a book of practical value to supplement the series of papers on sign writing which appeared in WORK, Vol. I., get the "Art and Craft of Sign Writing," from 15, St. Ann Street, Manchester. It is the most complete work published, containing everything appertaining to the subject, coloured and gilded samples, etc. The price is 21s.—F. P.

Patent Leather Boot Varnish.—OLD SUBSCRIBER.—When patent leather is first taken into wear, its brightness may be preserved by well dusting and rubbing with a soft cloth, and then applying a little white of egg with the finger. This being such a fine transparent layer, it seldom wants washing off; but should the leather want cleaning to receive any other preparation, it can be easily removed with a little warm water. A good varnish that will wash off can be made by boiling ½ oz. of logwood chips in ½ pint of soft water, and adding a piece of copperas about the size of a filbert nut. Strain off the chips, and add to the liquid 1 oz. of gelatine, ½ oz. of isinglass, 1 oz. of sugar, ½ oz. of glycerine, and 1 gill of common port (ale will do). Boil gently, and well stir till all are dissolved; strain again through fine muslin, and when cold it is ready for use. It should be about the thickness of double cream. Another good and simple dressing for patent leather is—one of linseed oil to two of best cream. Just warm it on a slow fire while you mix it well together. Apply with a piece of sponge, and when dry, rub with a soft cloth till you get a brilliant polish.—W. G.

Lithographing. — LITHO. — There is no paper published which is devoted exclusively to lithography, but there are several which deal with lithography in connection with printing, publishing, and other branches of the trade; such as the *Lithographer*, the *Printing Times and Lithographer*, the *British and Colonial Printer and Stationer*, the *British Printer*, etc. I should recommend the *Printing Times and Lithographer* (published at 73, Ludgate Hill, E.C.) and the *British and Colonial Printer and Stationer* (published at 58, Shoe Lane, E.C.); the former being a monthly paper, and the latter a weekly one.—A. J. A.

Cooking Stove.—T. P. (*Weston-super-Mare*).—I have not any information on the subject of the curious cooking stove described in your cutting from *Cassell's Saturday Journal*. I scarcely think (ingenious though the device is) that it will, as the writer says, revolutionise the art of cooking. With regard to a good paraffin cooking stove, Rippingille's will bear favourable comparison with any other maker. I have used them myself, and frequently have to overhaul and repair them, so can speak from experience. For cleanliness and convenience, especially in summer time, these stoves are very useful indeed. I think your friend must have neglected his stove for it to have worn so badly; with proper care, they will last for two or three years without repairing. The following directions may perhaps be of service to users of oil stoves. Fill the tank up every day of using, whether there is any oil left in or not. Carefully wipe all spilt oil off the tank before lighting; avoid, if possible, the boiling over of saucepans, etc., placed on the top. If they do happen to boil over, see that the stove is wiped dry after it is done with. If put away out of use for a time, empty the oil, take out the wicks, and keep in a dry place. By these means the stove will last as long again.—R. A.

Spangled Tin Goods.—A. H. K. (*Birmingham*).—I am unable to give you the process by which this is done, as I do not think it is generally known. You would most likely be able to obtain the material from the Tin-Plate Decorative Co., Neath. —R. A.

Moderator Lamps.—W. M. (*Market Drayton*).—You can get your lamp repaired at Benham & Froud's, Chandos Street, London, W.C., or Gardner's, Charing Cross; and there used to be some years ago a shop in Gerrard Street, Soho, W.C., whose proprietor dealt specially in lamps of this kind, but I cannot say if it is still in existence. Your lamp, when in good condition, and if it is a full-size one, ought to run at least four hours with once winding. —R. A.

Dead Black. — BRASSWORK. — The best thing that I can recommend you for a dead black is something that I have been using lately myself for my camera and lens tubes. It is called "Enameloid," sold in shilling bottles by the Frederick Crane Chemical Company, 22, Newhall Hill, Birmingham. It is a perfect dead black, absolutely non-reflective, and will bear any handling. Berlin black is also a very good black, but not so dead a surface as enameloid.—R. A.

Piano Sound-Board. — PERSEVERANCE. — The sound-board must be planed all over, not merely at the edges. You can obtain a sound-board (ready to put in, with the exception of the bars and bridges) from R. Peace, Blackstock Road, Finsbury Park, London.—T. E.

Rust on Wrest-Pins.—F. S. M. (*Huddersfield*).—Having cleaned the rust off, get some good Brunswick black, and with a camel-hair brush paint each pin and allow to dry. You can clean the bolts with emery-cloth, but you will probably take the blue off. If you wish to blue again, take one out at a time, and hold in the flame of a gas-jet near the head until it turns blue, or you may black them.—T. E.

Cox's Glue.—G. A. (*Liverpool*).—Write to the agents, Fordham & Co., York Road, King's Cross, London, N.W., when they will probably inform you where to obtain it in your town, or send you the quantity you require.—T. E.

Piano Matters.—AMBI-DEXTER.—I should make your bracings 4 × 3. From your letter I judge you would succeed. With regard to your other question, £6 would cover cost.—T. E.

Tuning Hammer.—The hole is drilled in before it is tempered, the top of the shank is square where it is inserted in the handle, and a washer riveted on the top; the handle is simply turned out of hard wood. You can purchase one for 5s. 6d. from Buck, Tottenham Court Road, London.—T. E.

Piano Matters. — PUZZLED. — I presume you have made the strings too wide apart for the hammer-head to strike them. With a flat punch knock the pin a little closer, and if there is a deep impression, re-cover. As you have put more strain on your piano, you will have to strengthen it by gluing some half-inch hard wood up each side of the bracings as far as wrest-plank.—T. E.

Fretwork Patterns for Piano.—F. S (*London, W.*).—Write to H. J. Fletcher, 161, City Road, London, E.C.—T. E.

Piano Keys.—LOWERBY.—If your keys are made of ivory, rub with No. 1 glass-paper, then polish with a flannel pad damped with methylated spirits and whiting.—T. E.

Fairy Bells to Piano.—J. H. C. (*Edmonton*).—You must tune to the natural notes of a piano if you can get access to one. It is a simple matter to tune them to each note. Make the shortest string to the pitch or middle C on the piano, then follow each white key towards the bass, and tune each one following, when your longest string will be two octaves below pitch C. You can purchase a few wrest-pins or pegs at any pianoforte dealer's.—T. E.

Piano Wrest-Plank.—J. C. (*Bolton*).—To take out piano wrest-plank, lay the piano on its back, and take a slip of wood and fit in at the bottom edge of the plank, and mark very carefully with a pencil where every string crosses. This makes a scale, as your hammers must all strike the strings when your new plank is in. Now take a sheet of paper the size of the plank, and with a piece of heelball rub over the paper when laid on the bridge, so that you get your bridge in the right place. Now take off your strings, and bolts out, then take off the wood on top and chop out; make the new one exactly the same, and, if possible, take the bridge off whole to use again.—T. E.

Looking-Glass Frame.—BARRA.—If the frame is a plain moulded one, without enrichments or carvings, you would have little difficulty in staining and polishing it black, as you wish. If perfectly plain, the gilt surface could be easily removed, or at least reduced, by rubbing with some fine glass-paper, taking care in so doing not to round off all square members or sharp edges; if there are carvings, you might use a little methylated spirits with a rather stiff brush, such as a sash tool, but do not use water unless you allow it to thoroughly dry, as polish or varnish will not take kindly to anything damp. Having prepared the groundwork, mix some vegetable black in one part polish, or varnish, and three parts methylated spirits; give several applications till you have a dull, even surface; then polish, using white polish and a little gas, or Frankfort black, in your rubber, or mixed with your polish, and finish with glaze, or varnish, or spiriting out, as may suit you best. Failing your ability to French polish, I am afraid you will have to fall back on the process you seem to object to, and use some black enamel; but of this there are several brands in the market, one of which, known as "Foo-chow," being made of spirit instead of oil varnish, ought to suit your purpose capitally. It does not give that thick bright surface you object to, and it can, by thinning down with methylated spirits, be made to give an almost dull appearance. You will not, of course, without using extreme care, be able to save untouched all the parts you require gilt; it will be better to do all over as suggested, then cut in the parts or any design you may require gilt with a little oil gold-size, procurable at most oil and colour merchants, to which, when nearly dry, you can apply gold-leaf, Dutch metal, or bronze. You will find full directions for gilding in Vol. II., pages 718 and 750. As regards the treatment of plain wood, instead of that faced with whiting, you do not say what kind of wood it is—whether polished or not; if the former, and a black ground is required, the foregoing treatment will suit; if the latter, the wood will require staining first: this can be done by means of a logwood stain, though it is cheaper and more cleanly to use French black stain, procurable at most places where veneers are sold, and colour merchants; or you might use the Improved Ebony French Polish, as sold by T. Jackson, 199, Borough High Street, London, S.E. This is a stain and polish combined. Should you require other colours than black, and wish to show the figure of the wood, you will have to stain by means of one of the many recipes to be found in "Shop," and finish by polishing.—LIFEBOAT.

Iron Lasts.—A. T. H. (*Acton Green*).—You say "pack"—but of course you mean fit up—"iron lasts for pegged and riveted boots." Well, for the former an iron last is of no use, but a wood last must be used, for, in making pegged work, the peg-awl must go through the whole of the materials, and a little way into the last. This is that the peg may go just through, that it may be rubbed down inside; hence the use of the peg-rasp and peg-knife. Were you to use an iron last, you would blunt the peg-awl each time you made a hole, and the peg would not go through, and solidity could not be the result. Iron lasts are just the thing for the latter, as the rivets are clenched as they reach the last. They are fitted up according to their particular construction. If they are ordinary block lasts, and you want to fix a joint or long-leather on them, it can easily be done by fixing these with a waxend to the block before putting the block on the last. Of course they must be fitted and blocked to their shape on the last first. Or another, and the best, way, is to take the last to an iron-foundry, and have holes drilled where you want fittings to be put on. You can fill the holes up with gutta-percha or wood, and then nail the fittings on the lasts. The way to sharpen a shoemaker's buff-knife is to run it through a piece of tallow, and lay it flat on a board with the edge you want to sharpen flush with the edge of the board on the right-hand side; hold the knife on firmly with the left hand, by pressing all four fingers upon it, and with the stem of a sewing-awl, stiletto, or steel burnisher, rub down the edge backwards and forwards; this will throw a fine burr right across the edge. Turn it over, and repeat this process on the other side. This done, hold the knife, edge upwards, in the left hand; place the right thumb against one of the side edges, and draw the awl from the centre to the corner, letting the awl run on both the burrs at the same time, and keep stroking it till the edge is flat. This will throw the burrs over on to the sides again, but they will have a keen and even edge, for each time it is sharpened, it throws over a little more steel. This second process has to be repeated on the other half. Do not let other tools come in contact with it; keep it by itself.—W. G.

Crayon Drawing.—W. W. C. (*Kelso*).—A rapid and showy method of shading is by first "stumping" in the shadows, and then hatching over them with the chalk point. The stump, I may explain, is a little roll of wash-leather, cut to a conical point, which is dipped in powdered chalk and worked over the paper. "Hatching" is drawing a series of lines which cross each other, but they ought not to cross at right angles. This, however, is not the method in favour in the Government Schools of Art, or in the Antique School of the Royal Academy. In these schools it is the practice first to go over the shadows with very rough hatching —scribbling it might rather be called—and then to work and "stipple" over and between the lines with the chalk point, taking out any harsh line or touch with bread-crumb. This plan gives greater delicacy, and enables the student to render such shadows as he sees before him far more accurately and conscientiously than the first-named

method. For serious study, its advantages can scarcely be questioned. W. W. C. should, if he can, see a School of Art, or get a lesson or two from one of the students. He would thus learn much more about the matter than from columns of description. As to tools, all that he needs will be his port-crayon, a few French chalks, and a penny loaf.—S. W.

Piano Repairs.—W. R. W. (*Poplar*).—You can obtain new hammers for your piano from Hallpike, 213A, Mare Street, Hackney, London (probable cost, 10s.), and wire from Hughes, 37, Drury Lane (probable cost, 25s.). Apply to Rudd & Co., 74, Dean Street, Soho Square, for an estimate.—T. E.

Piano Wood.—MUSICUS.—Formerly oak was used for piano wrest-plank, and if you veneer it well to prevent splitting, I see no objection to your using it.—T. E.

Square Piano.—H. A. C. (*Plaistow*).—Any stationer will give you the information about binding WORK. There are only sixty notes on your piano, but you have confused notes with strings. There are two strings to each note, except perhaps at the extreme bass, where there are a few single strings. When you string your piano, count notes, not strings.—T. E.

Piano Label.—S. H. B. (*Barnstaple*).—It is a very simple matter to put label or name on fall of piano. You can either use polish or glaze. Scrape the old label off with a chisel carefully, then level with glass-paper, rub a little glaze or polish on the back of label, and put it in its place. See that the air is pressed out with a soft rag, and leave to dry. Then give it a rubber of polish in the ordinary way.—T. E.

Piano Making.—CRESCENDO.—Yellow pine will not make a good sound-board, as it is too soft, and makes the tone without ring in it. A better substitute for Swiss pine would be good quality spruce, free from knots. You could obtain a sound-board ready jointed from R. Peace, Blackstock Road, Finsbury Park, London (cost about 5s., carriage and packing extra). The bottom plate is made of iron ½ in. thick, and is bolted on the bottom of piano; the holes are drilled in the top edge and pins placed in. I should advise you to buy one ready made. Covered strings, 11s. to 12s.; steel wire, 1s. 9d. per lb.; wrest-pins, 2s.; bridge-pins, 1s.; bent side and bottom plate, 3s. 6d.; keys and action, £3.—T. E.

Felt on Piano Hammers.—NOVICE.—Kindly see reply to G. T. (*Chatham*) on page 61, No. 108, Vol. III., of WORK. Felt may be obtained from Hallpike, 213A, Mare Street, Hackney, London.—T. E.

Fairy Bells.—F. (*Preston*).—I thought I had made the instructions clear. It says distinctly: "Over the bridges you will find sizes of wire and number of notes in brackets. There are four strings of No. 8, four strings of No. 9, four strings of No. 10, and three strings of No. 11, all steel music wire."—T. E.

Fretwork.—H. S. C. (*Manchester*).—Get the Indexes to Vols. I. and II. of WORK, and you will find fretwork hints and designs and cupboards by the score.

Bicycle Parts.—SUBSCRIBER.—All parts for cycle making are obtainable of—Brown Bros., 7, Great Eastern Street, London; W. A. Lloyd, Lionel Street, Birmingham; Thomas Smith & Sons, Saltley, Birmingham.—A. S. P.

Ticket Writing.—WUERDLE.—For materials, paints, brushes, etc., apply to Messrs. Brodie & Middleton, Long Acre, London, W.C.

Worm and Wheel.—LETTER CUTTER.—I do not think you can buy a worm and wheel such as you require, and will have to get them made. You did not say what pitch the teeth would have to be, but as the spindle of the worm-wheel is only ⅜ in., I may suppose they will be fine, and the worm only of the ordinary ¾ in. Whitworth screw rate. There must be many a workman in Aberdeen who could make you a worm and wheel such as you describe, and I think 15s. should cover the cost.—F. A. M.

Water Motor.—A. J. (*No Address*).—You ask what pressure is required in the mains to give you one horse-power. That depends on how much you use. You might as well ask what pressure you must have in a steam boiler to give you 10 h.-p. You might have a pressure of 5 lbs. and get 10 h.-p. in one engine; or you might have 100 lbs. per square in. in another, and yet get no more. In some mains you may have one or two hundred lbs. per square inch, and a small quantity of water at that pressure will give you considerable power; so, too, you may have a slow stream of water, having only a few inches of fall, and yet, if there be plenty of water, you may get the same power. See my remarks on page 23, middle column, of the present volume, and do not think of drawing one horse-power from the town mains; it may cost you five shillings per hour. It is all very well for those who have a natural fall of water.—F. A. M.

Piano Defects.—L. C. (*London*).—I should judge that the depreciation in the tone is not caused by the small cracks (which denote that the wood has not been dry), but by the sound-board having sunk, so that the strings do not bear sufficiently on the bridges. Take out the back, and wedge three or four bottle-corks tightly between the upright bracings and the sound-board. This may improve it if the sound-board is firm. The action you have sent a sketch of is known as the "Costa." Probably the felt on the hammer rest is hard; if so, place a piece of flannel over it, and try. Does the hammer-head touch the wire that raises the damper? Noises can only be detected by patient listening to find the cause. If the hammer does not strike with sufficient force, turn the wire which is under the arm that is prominent to the left; if it does not free itself from the string, turn to the right.—T. E.

Blow-Lamp.—WATER-PIPE and E. D. (*No Address.*)—A very good lamp for the uses you wish to employ it for is the French methylated spirit blow-lamp, Fig. 1. If you really wish to try and make one, you cannot do better than get an old police lantern; this will give you a start with the body if you take the glass out, and cut front to the shape shown in the sketch; the lamp also could be brought in with a little alteration. The top chamber, C, is the part that you would have most trouble with; it is, as shown in sketch, spherical in form, with a screw on the top for filling; there is usually a valve in this screw, but I will tell you how to dispense with that. The simplest way to get over the difficulty is to make a vessel as near the shape as you can, and this you can easily do (see Fig. 2, which illustrates the following description):—Take a strip

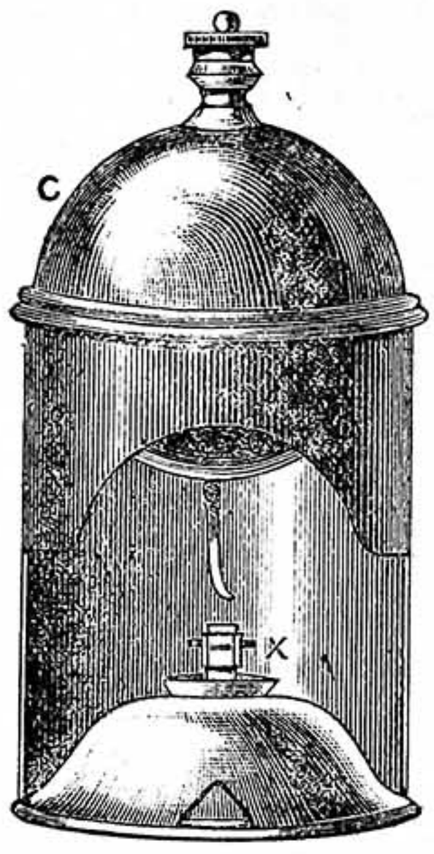


Fig. 1.

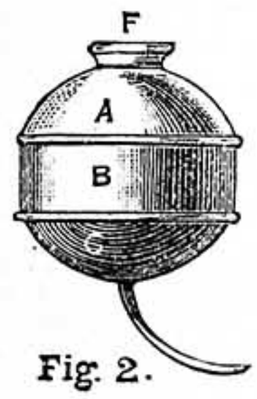


Fig. 2.

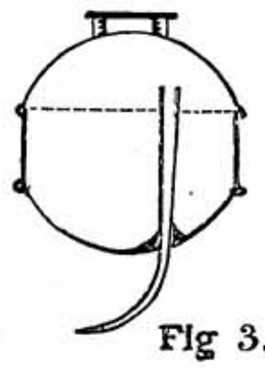


Fig 3.

Fig. 1.—Blow-Lamp. Fig. 2.—Home-Made Reservoir, equivalent to C, Fig. 1. Fig. 3.—Section of Reservoir, showing Position of Blow-Pipe.

of copper or brass, whichever you please, ¾ in. in width, and long enough to go round the inside of the lamp body; let it fit fairly tight, and give a ¼ in. lap and solder it; this will form the centre piece B. Next cut a circular piece, ⅜ in. larger in diameter than the piece just made, hollow this up, slip it *inside* the piece B, then cut another circular piece for the top A; as this ought to be hollowed up more, cut a little larger than the piece C, and this piece must be "capped" on to the piece B, as it will then form a ledge, and prevent its slipping down the lamp body. Before soldering, a hole must be punched in the A piece for the filling screw F, which should be a good one, and have either a leather washer or a ground in stopper, such as is used in the best class hot-water bottles. A small hole must also be made in the C piece for the blow-pipe to pass through. Fig. 3, which is a sketch of the reservoir, shows how the pipe is situated: it must be some distance out of the centre, and should come up inside to within ½ in. of the top, so as to allow the reservoir to be somewhat over half full to start with. Solder this pipe round well inside, fix the filling screw, and then solder the top and bottom. The blow-pipe may be the end of one of the ordinary gas-fitter's brass blow-pipes, costing about 6d. The lamp itself should have a single tube ¼ in. or $\frac{1}{16}$ in. in diameter; the wick should be the same as used in ordinary bull's-eye lanterns, viz., that sold in large balls; it is a soft, loose, twisted wick, and should not be packed in too tightly. The flame may be regulated to some extent by the same means that was adopted in the benzoline lamps when they first came up—that is, by an outside tube made to slip firmly, yet easily, over the wick tube (see X, Fig. 1). To use the lamp, fill the vessel C, Fig. 1, about three parts full, or, in other words, not quite up to the level of the inner tube (see dotted line, Fig. 3), with methylated spirit, and the lamp with the same; light the lamp, and as the spirit in the top vessel gets hot, it throws off a gas, or vapour of spirit, which, blowing on the flame of the lamp, forces a strong jet of flame of intense heat outward. Should the lamp not commence to blow in a minute or two after lighting, blow it out, and run a small wire up the blow-pipe to clear it; by being careful about this a valve on the top may be dispensed with. I think that for most purposes that a blow-lamp is required this home-made affair will answer well, but, of course, you cannot expect to do brazing with it. I have not made any experiments to try if this lamp will work with benzoline in place of methylated spirit, but I should think that very likely it would.—R. A.

Dampness.—W. N. B. (*Glasgow*).—The only remedy is a dry area, a description of which you will find on page 461, No. 29, Vol. I. Do not, under any consideration, waste your money in rendering the inside of the walls with Portland cement, for although it is very good in some instances, it would be of no service in yours. The ground being so very much higher at the back of house than the front, it is most probably above the damp-proof course; and if it is so, you will find it impossible to keep out the damp whilst the ground touches the wall above the floor and the damp course, and your only remedy is as above. We will now take it for granted that you have constructed a dry area wide enough for a man to work in comfortably right round the external walls of the room you complain of, and still the room is damp (after having allowed a sufficient time for the room to dry—say, three months); and from the fact of the ground under the floor having been asphalted, I should not be very much surprised. You can take it for granted that the damp course is defective, or that the stone facing of the wall is very porous, and absorbs the driving rain and other moisture. You should now from the dry area carefully inspect the damp course (if one exists), and see if you notice anything wrong with it; and, if so, remedy it. If there is not one, and you still wish your room to be drier than it is after constructing a dry area, you must put one; but this job requires rather a lengthy description. If, as far as you can see, the damp course is all right, insert three or four air-bricks along each wall. If you consider the external stone work to be porous, you had better render it with Portland cement and clean-washed sand, in the proportions of three of cement to one of sand, 1 in. thick, and trowel the face down very fine and smooth, and do not leave it from the float. A very good plan would be to cover the external faces with slates or other waterproof material, but whatever you do must be done from the outside, for that is where the defect is.—E. D.

Green Stain.—A. H. W. (*Newcastle*).—The usual medium for staining green the fancy artistic furniture to which you refer is made by mixing verdigris with hot vinegar; but I find the aniline dyes known as Tomlinson's, sold in one penny and threepenny packets, equally as good; in fact, I prefer the latter, owing to the facilities for getting various shades. For instance, if the green is too bright, it is easy to add a little of the blue or black dye. Both can be finished by the usual process of French polishing, using white or transparent polish and varnish. If "filling in" is used, it is, of course, coloured to match by adding some green pigment, such as emerald or Brunswick green.—LIFEBOAT.

Stencils.—J. W. (*Shobdon*).—Your experience with regard to the suitability of "bought" stencils for any special purpose is a common one. The rubbing of stencil border you enclosed is a *motif* not original to myself. The combination of rose, shamrock, and thistle worked into an acanthus scroll, is carved as a frieze to a wing of Buckingham Palace, built by one of the "Georges," and I have repeatedly seen it worked as a a stencil scroll border. The one you send is fairly well drawn, and does credit to your experience, showing that you have grasped the idea of practical fitness in the arrangement of the ornament for stencil cutting.—LONDON DECORATOR.

Lantern Slides.—T. A. G. (*Stratford, E.*).—Transparent black lines or shadows, and clear glass in the high lights, such as you ask how to produce, are signs of a perfect lantern slide, and most amateurs find this their greatest difficulty. First, as to the best process. There is no doubt that the finest results can be obtained by the old wet-plate process. This is used by some of the largest and best makers, and has the additional advantage, where a quantity is wanted, of being the cheapest; but if you are an amateur, making only a few for your own use, the dry-plate method or the carbon would be far better. The latter is not very often employed, but when successfully done, very beautiful effects can be obtained; directions for this, unless asked for, would be too long for the columns of "Shop." This leaves the dry-plate process the one most favoured by general workers. The plates are best bought ready prepared, and there is little to choose between those of the best makers. They are all slower than ordinary plates, and I would advise you to use those made by the same firm as you patronise for negatives, except you wish for warm tones, and the only ones in the market I know of which will give these are the Ilford "Alpha" lantern plates. I cannot make sure, from your letter, if you ask for best developer and exposure for various subjects, or only for making slides of hymns; there would be a difference, the latter having no half-tones, only black and white. For this work use a slow plate, rich in silver, for the negative, and do not over-expose it: if anything, the other way; and if you are familiar with the quinol developer, use that; if not, a pretty strong pyro. Develop well out, getting plenty of density. For the lantern slide about the same treatment, and either quinol or iron developer (not pyro. for this).—W. E. D., JR.

Coloured Picture.—F. C. (*Clacton-on-Sea*).—The specimen you send is a coloured print mounted in contact with the glass, made transparent, and backed with plaster of Paris to give it greater brilliancy. You would not find the process difficult. To obtain like results, get a print (the one sent is printed in colours, not coloured afterwards), then make some good strong starch, such as is used for mounting

photographs; coat the print with this, and rub down upon the glass. Scrape out as much paste as you can by going over the back with a piece of hard wood cut thin at the edge, something like a turning chisel or the end of a paper-knife, working from the middle to the edges. The more carefully this part is done, the better the article will look when finished. Let it dry, then sand-paper as much of the paper back off as possible, taking care not to make a hole; brush over with paraffin wax to make it transparent, and if a concave glass, like specimen, fill up with plaster of Paris, or you can back with white paper. You would, I think, find photographs mounted in the same way look much better than prints, and for local views would be easier to obtain. Use those that are printed rather deeply; they could then be coloured on the back with oil colours after being made transparent, and finished off with white paper backing; or if not coloured, they need only be cemented to the glass.—W. E. D., JR.

Banjo Vellum.—C. E. (*London*).—There is no necessity to sew your vellum when putting it on. If your band is a piece of thin brass, I should advise you to take it off and fit a new one. Banjos having only a thin piece of brass for a band are never a success. When the top of band is pulled down level with the vellum, the points of brackets are almost sure to cut into it, and, of course, break it. Get a piece of brass long enough to go round hoop, ½ in. wide and about ⅛ in. thick, bend it round to shape, halve ends for lapping over one another, then braze them together, or drill two holes and rivet them. Put the band on hoop, and mark exactly where each bracket comes, then file out notches to sink the nose of brackets in, so that they are clear of vellum. Use a piece of brass or galvanised wire to go inside of vellum and under band. In putting on vellum, have it at least 2 in. larger in diameter than size of hoop; or, better still, have it 3 in.—it will be all the easier to put on. With a bradawl make a series of holes round the edge of vellum, keeping them about ¼ in. from the extreme edge, and about 1½ in. apart. Take a piece of banjo string, second or third, and long enough to go round edge of vellum, and thread it through the holes, taking care that both ends of the string come out on the underside. Put the vellum in water to make it pliable; do not let it stop in too long—say, about one minute. Let the water drain off. Lay the vellum on hoop, put on the brass wire ring, and pull the ends of string, turning up edge of vellum all round. Pull the string tight, and see the edge of vellum lays well over; tie the string, and then put on the band that pulls the vellum tight. Put on six or eight brackets at equal distances apart, then pull down band evenly all round. It will be better to use longer screws, made specially for the purpose. Let the band stand up above the level of hoop, say, about ¼ in., until the vellum is thoroughly dry before pulling down further; if you let it stand a couple of days you will be on the safe side, the part of vellum under band taking longer to dry than the exposed part. Put on all the brackets, then cut off edge of vellum near top of band, so that there will be no fear of its slipping when pulled down. When dry, it must be pulled down evenly and gradually, a little at a time, until the band is level with the edge of hoop. Your vellum ought then to be very tight; if it is not, keep on pulling down until it is. Of course, the string is taken off vellum after the band is on.—J. G. W.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Chair Seats.—W. J. B. (*Deptford*) writes:—"I want some chair seats. I have tried those that are sold at oil-shops, but I find they don't last long, being composed of three pieces of very thin wood pressed together. What I want is something similar, but all in one piece—say, ¾ in. thick. Please say what kind of wood would be most suitable."

Battery.—T. R. (*Ashton-le-Willows*) writes:—"Will some reader inform me if there is a battery that will work for six months without being attended to? It is wanted to make contact every second—half-second in contact and half-second off. Current from two Leclanché cells will be as strong as would be required."

Fret-Wood.—B. C. E. (*Birmingham*) writes:—"Would any reader kindly tell me the best place in Birmingham to get fret-wood, and what is the price per foot?"

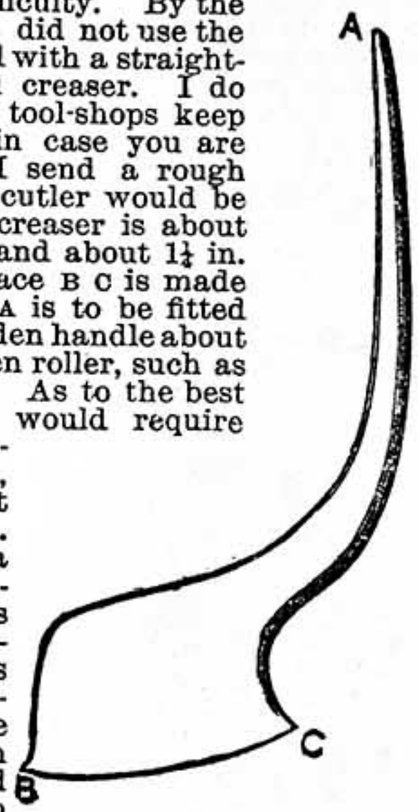
Riddle.—W. H. (*Pendleton*) writes:—"Will any reader kindly give me a design for a riddle for a chaff-cutter? Also information as to how it is worked?"

Melting Brass.—H. B. (*East Hartlepool*) writes:—"Will any reader kindly give me a design, dimensions, and instructions how to make a small furnace to melt about 12 lbs. of brass in a crucible? I want the furnace to be made on the portable principle, so that I can take it to pieces or put it together in a very short time. I want the same to be kept in the back yard, to be used to make brass ornaments."

Compasses.—J. W. E. (*South Darenth*) will be obliged to any reader who will furnish him with a design for a pair of 6 in. steel compasses, with a short note as to making the same.

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Checkering.—A. T. B. (*No Address*) writes, in reply to CHECKERED (see page 142, Vol. III.):—"To begin with, the tools you will require are—(1) a checkering-board, which should be made of dry wood, planed up true and square, and of any convenient size, say, 24 in. long by 14 in. wide by ½ in. thick. A piece of millboard glued on to each side will give a harder surface to work upon, and prevents warping, but the side used for checkering must be quite flat and smooth. (2) A checkering-rule. This is simply a parallel rule on a large scale, which should be at least as long as the board, and a little narrower. One of the long arms of the rule is fixed to the board near the edge, leaving the other arm to work freely. A cabinet-maker would make the board and rule. I do not know the cost, as I never bought one, but have made my own. I should think you might do the same without much difficulty. By the way, the old checkerers did not use the parallel rule, but worked with a straight-edge instead. (3) Steel creaser. I do not know whether the tool-shops keep this tool in stock, but in case you are not able to get one, I send a rough sketch, from which a cutler would be able to make it. The creaser is about 6 in. long from C to A, and about 1¼ in. long from C to B; the face B C is made very smooth; the end A is to be fitted firmly into a strong wooden handle about 10 in. long. (4) A wooden roller, such as an ordinary rolling-pin. As to the best means to checker, it would require considerable space to describe the process fully, and it varies somewhat with different workers. A short time with a checkerer would probably do more than pages of letterpress, but perhaps the following hints may be of some use. Before being checkered, the leather is damped with clean water, stretched more or less, rolled (on a piece of polished marble or other suitable substance), and left till nearly dry. Place the checkering-board on a bench or table of convenient height, raising the board slightly, so that it may slant towards the worker; draw out the rule as far as it will go, and place under it the leather, so that a small corner extends beyond the rule and at the required angle; then the creaser, which has been previously heated (the degree of heat is learnt by experience), is held in the right hand at the lower end of the handle, while the upper end rests against the right shoulder. At the same time, the rule is held firmly by the thumb and the first and second fingers of the left hand, the third and fourth fingers resting on the board. To make the stroke, the creaser is placed close to the rule, the face B C on the edge of the leather nearest the worker, and the right shoulder is moved rapidly forwards and backwards, driving the creaser across the leather. As soon as the stroke is made, the rule is moved the required distance without raising the left hand from the board; another stroke is made in the same way, and so on till the leather is covered. It is then turned to the opposite corner, so as to form a check, and the operation is repeated. I strongly advise you not to make your maiden attempt at checkering with anything valuable, but procure instead some waste pieces of leather, and work upon them until some confidence is acquired in the use of the tools."



Steel Creaser.

Cotton Belting.—A. R. (*Scorrier*) writes, in reply to S. A. & Co. (*Stockport*) (see page 158, Vol. III.):—"To prevent injury to the edges of your cotton belts, sew strips of leather the whole length of your belts, letting the leather project a little beyond the edges of the belt, so as to take the friction. Cotton belts can be had with strips of leather fastened with copper wire by means of a machine."

Camera.—M. (*Bishop Auckland*) writes, in reply to BOY SORTER (see page 206, Vol. III.):—"(1) You can buy a ¼-plate camera, lens, and stand, from Messrs. Lancaster & Son, Colmore Row, Birmingham, for 21s.; and having had a little experience as an amateur photographer, I would not recommend you to get one at a lower price. If you make any progress, you will soon want a larger camera. You had better send for Messrs. Lancaster's catalogue (price 4d.), which gives prices and descriptions of a great many different kinds. If you find any difficulty in selecting what you want, if you write again I shall be glad to give any other information. (2) 'Photography for Amateurs,' price 1s., Cassell & Co. (3) The Ilford dry-plates are very good."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—T. L. (*Riseholm*); ROUND O; H. B. (*Sheffield*); T. W. P. (*Ilkley*); TROOPER; LITTLE JIM; G. W. O. (*Durham*); NEVER-SAY-DIE; S. C. T. (*Knutton*); A NEW SUBSCRIBER; W. B. (*Bruntcliffe*); J. H. (*Bacup*); W. W. (*London, E.*); G. F. C. (*Southampton*); J. J. B. (*Stockton-on-Tees*); LONG VALLEY; R. S. D. (*Edinburgh*); W. E. H. (*Leeds*); D. B. (*Middlesbrough*); DARKSLIDE; S. C. T. (*Knutton*); G. E. L. (*Battersea*); ANXIOUS; J. H. (*Ballina*); W. O'N. (*Athlone*); SKIBO INCE; W. J. C. (*Tavistock*); DROWSERS; S. N. (*Dalston*); J. W. A. W. (*Wednesbury*); W. T. C. (*New Normanton*); IDEAS; JACK; W. H. N. (*Birmingham*); W. G. C. (*Bowham*); CONSTANT READER; T. J. G. (*London, E.C.*); A. T. S. (*Hackney*); W. C. (*London, E.*); E. G. (*Nottingham*); T. W. (*Loughborough*); BRUSHER; THE GUILD AND SCHOOL OF HANDICRAFT; F. B. (*Manchester*); WELL WISHER; RIVET BILSTON; W. R. (*Mile End*); CONSTANT SUBSCRIBER; QUEEN'S ISLAND; H. B. M. (*Spalding*).

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